THE FOUNDRY

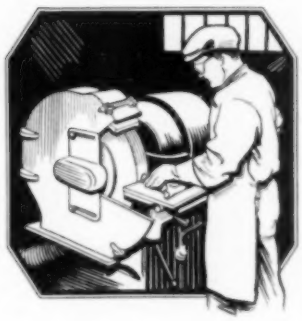
Established in 1892

EDITORIAL STAFF

DAN M. AVEY
Editor
FRANK G. STEINEBACH
Managing Editor
PAT DWYER
Engineering Editor
EDWIN BREMER
Metallurgical Editor
New York
E. C. KREUTZBERG
B. K. PRICE
L. E. BROWNE
Chicago
W. G. GUDE
Pittsburgh
E. A. FRANCE JR.
London
VINCENT DELPORT

Advisory Staff

JOHN W. BOLTON
JOHN HOWE HALL
HARRY A. SCHWARTZ
CHARLES VICKERS



CONTENTS for NOVEMBER 1932

Volume 60 Number 13

EDITORIAL 11
Accuracy Features Cylinder Cores 12
Fixed Costs 2.2 Times Prewar Level 15
A. F. A. Picks Chicago for 1933 17
Buy for Rehabilitation 18
Loam Mold for Large Steel Casting 20
Through the Years with The Foundry 22
Iron for Pressure Castings 24
Machines Feature Paris Display 26
Making Manganese Bronze 28
QUESTIONS AND ANSWERS 30
Viewing Foundry Developments at Short Range 33
The Foundry Family Photograph Album 34
MEN OF INDUSTRY 35
READER'S COMMENT 36
Prevent Losses with Proper Gates and Risers 39
European Foundry Practice 43
Western Foundryman Gets Early Start 44
Add Alloys in Form of Briquets 46
Castings Speed Fastest Cabin Liner 48
Scan Benefits of Code 51
The Adventures of Bill 60
New Equipment for Foundries 62
Foundry Activities 65
New Trade Publications 66

Cover Illustration Courtesy Ford Motor Co.

THE FOUNDRY is published monthly on the 15th of each month by the Penton Publishing Co., Penton building, 1213 W. Third St., Cleveland, O. C. J. STARK, President; J. D. PEASE, Vice President; F. V. COLE, Secretary. Member, Audit Bureau of Circulations Associated Business Papers and National Publishers Association.

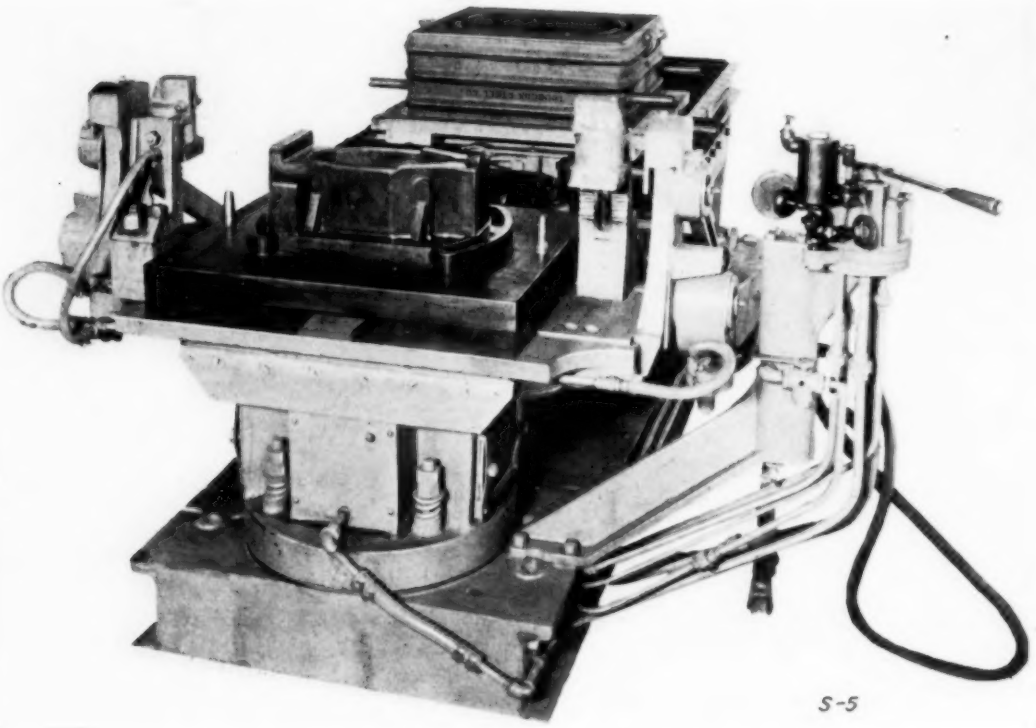
Branch Offices: Chicago, Peoples Gas building; New York, 220 Broadway; Pittsburgh, Oliver building; Washington, National Press building; London, Caxton House, Westminster, S.W.1; Birmingham, England, 14 New street; Paris, 9 Rue de Londres; Berlin, Lichterfeld-West, Dahlmerstrasse, 64a, Germany. Cable address, Irotrapen, London.

Subscription: United States and Mexico, $2.00 a year; Canada, $3.00 a year; Great Britain and other Foreign Countries, $4.00 a year; single copies 25 cents. Copies published three months or more previous to date of current issue, 50 cents each. Entered as second class matter at post office at Cleveland under the Act of March 3, 1879.

Copyright 1932 by the Penton Publishing Co.

IF IT'S A HERMAN IT'S WORTH USING. IT MADE ITS WAY BY THE WAY IT'S MADE

HERMAN MOLDING MACHINES



S-5

Bulletin H-2 gives full information pertaining to this remarkable 750 lb. Capacity-Hi-Speed Jarr Rollover and Pattern Drawing Molding Machine.

Three popular sizes: 20 x 24", 20 x 30" and 20 x 36"

IT jarrs, rolls over and deposits the finished mold on roller conveyor in one (1) minute.

Shipped from stock complete with automatic air clamp, roller conveyor, etc. No extras to buy.

IT is also an ideal core making Machine.

HERMAN PNEUMATIC MACHINE COMPANY

GENERAL OFFICES: Union Bank Building PITTSBURGH, PA.
MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U. S. A.
Foreign Works: Pneulec Limited, Mafeking Rd., Smethwick, near Birmingham, England
Hartung Aktiengesellschaft, Berlin, Lichtenberg, Germany
Gibson Battle & Co., Limited, Sydney, N. S. W.

THE FOUNDRY for November

Depression SAFETY

BELIEVE it or not, sickness and death rates from disease are lower during a period of business stagnation. Abstinence or avoidance of over-indulgence may account for this fact. However, although accidents in industry increase with business activity, they do not retard proportionately with the drop in production, according to C. W. Bergquist, Western Electric Co., speaking as president of the National Safety council at its recent annual meeting. Mr. Bergquist says that many new and disturbing factors complicate accident prevention work during depressions. Safety departments are obliged to work with reduced staffs, smaller outlay for maintenance, special safeguards and equipment. The mental reaction among workmen is even more serious in effect. Men are worried, perplexed and uncertain about their jobs. Their health may be affected by neglect of medical and dental service which their reduced earnings will not afford. Those who work at infrequent intervals lose the routine, are inept and more accident prone. The safety director's problems are multiplied.

How Output Is RETARDED

ANOTHER definite reaction, due to interrupted or low operation rate is shown in the comparative figures of output per man in many foundries. With staggered employment the men lose some of the rhythm or timing which produces efficiency in any manual operation, even where mechanical equipment is used. Those who compile definite data on production note that the output per man has dropped in many cases to less than 50 per cent of normal. Thus in foundries reporting 120 pounds per man in 1929, the figure today is 70 or 50 pounds of castings per unit time. Some of this is on piece work, where the incentive element is all on the side of larger production. The reason is found in the desire of workmen to continue active, unwillingness to hurry through to idleness and the desire to hold on to the present job on the chance that another may come along before completion. Good management should recognize these facts.

What About PRICES?

PRICE discussion between competing sellers is taboo. Buyers can and do exchange information on prices offered them and thus exert pressure effectively in demolishing quotations and depressing levels. The seller is intimidated by Federal law, while the buyer is free as the air from any governmental restraint. The demoralization due to this condition has been painfully evident to the foundry industry. D. S. Hunter, secretary of the Steel Barrell Manufacturers' institute, speaking at a meeting of the American Trade association executives states that he believes trade associations should concern themselves with the prices at which their industries sell commodities. He believes that it is possible to bring about price stabilization—*not price fixing*—by compiling and reporting current prices on products, dealing with closed transactions alone. If this is not feasible without breaking existing laws, only the changing of these laws will prevent chaos. Would the variety of cast products permit any price classification of value to the foundry industry?

What's New In NOVEMBER

WATCH like accuracy governs in the production, gaging and placing of cores for the new Ford V-8 motor (page 12). The flea that admonished the elephant to quit shoving had nothing on the foundryman who faces today's high fixed cost elements (page 15). The A. F. A. convention plus the 1933 World's Fair, at no extra expense (page 17). Foundries share benefits of unified rehabilitation move (page 18). Foundry style hints from Paris (page 26).

Fig. 1—Inspection of cylinder core assemblies. Concentricity of barrels and smaller cores are checked on turntables

Accuracy Features Cylinder Cores

Successful casting of Ford V-8 engine based largely on precision of positions in assembly

FORD V-8 engine cylinder block admittedly has offered a difficult and complicated casting problem to the Ford foundry. The successful casting of that block on a commercial basis therefore represents an achievement of no little importance, particularly when it is recognized that large production is demanded and costs must be kept at a minimum.

Design of the cylinder casting is based primarily upon the desire to produce a compact and rigid structure with as smooth and clean an outside appearance as possible and to reduce the total number of parts required in the complete engine. The design combines the cylinder block with the upper half of the crankcase and, in addition, the exhaust manifolds for both blocks have been combined within it, thus presenting further complication since double coring for water space between the cylinder bores and manifold passages is required. The result makes the engine much more accessible for maintenance work, and also lighter.

In developing the procedure necessary to produce the casting in large quantities, 3000 per day or more, it was recognized that previously established foundry methods would have to be revised and in some cases discarded. To produce a casting of the size, weight and compactness of the V-8 cylinder block was deemed almost impossible unless much greater accuracy and closer control of all operations than usual could be

Fig. 2—Every barrel core is checked for thickness of slab with yoke gages

maintained consistently and without deviation.

It therefore was decided that foundry practice could and would be placed upon a "precision workmanship" basis. Fixtures and gages, heretofore considered as belonging in the tool room and machine shop were brought into the pattern shop and foundry. A new procedure in pattern making, checking of core assemblies and in the degree of accuracy prevailing in the entire preparation of the molds was evolved.

Bringing All Factors in Line

Studies were made of the behavior of sand when formed into cores, of sand tempering, of core assembly, proper venting and other points relating to that casting problem. It is significant that other than using a sandpaper stick to remove the fins from some of the larger cores, no filing or fitting of the cores is necessary, or permitted. Cores are made to exact size, and at points where they might change their position in the mold, are provided with prints at joining points to prevent turning or twisting, or are held together or properly spaced by bolts, pins or chaplets. Accuracy of their relative positions in the core assembly is checked by fixtures or check gages with *go and no-go* indicators as in Fig. 2. Limits approaching the decimal dimensions of the tool room are utilized. Sixty-fourths or less are common. Except for a few larger dimensions a thirty-second variation will cause rejection.

The mold for the cylinder casting contains 43 cores, as shown in Fig. 3, not including two gate cores used in the pouring operation. These are assembled in several groups. The cylinder bank assembly is made up as follows: water jacket cores 3, exhaust port cores 3, valve ports 8, barrel slab 1, paste-on core 1, or a total of 16. Two of the three assemblies are required per mold, one right and one left hand, due to longitudinal and lateral offsetting of the cylinder banks. Other groups are as follows: valve house assembly 5, crankcase assembly 5, and the oil pipe bosses 1.

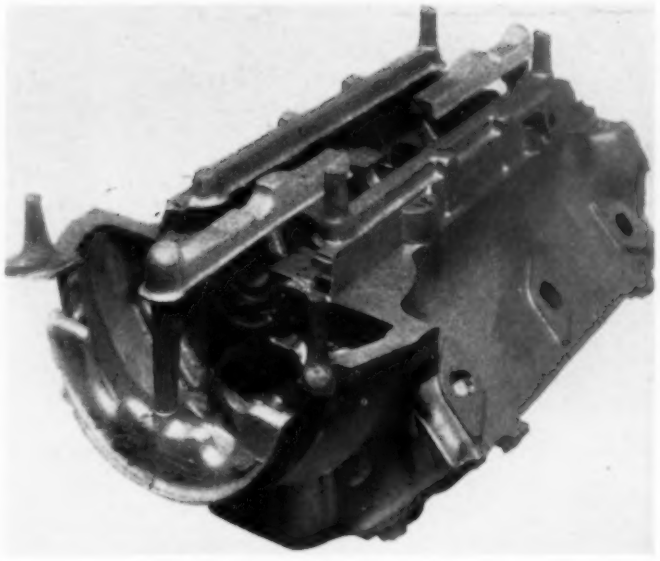


Fig. 4—Cylinder block casting just after knocking from the mold, showing location of the risers

Barrels Checked for Position

The cylinder bank core assembly has been given particular attention. The barrel slab core which includes the coring for the cylinder bores or barrels forms the base upon which the remaining cores are placed. Correct positioning of the four barrels is checked by a fixture before the other cores are added to it with a limit of plus or minus, 1/32-inch at ends of barrels. The barrel core is sprayed with the blacking, whereas a blacking dip is used for the valve port cores and bottom water jacket core. Still other cores receive an added treatment with oil, and in all cases the problem of venting has had

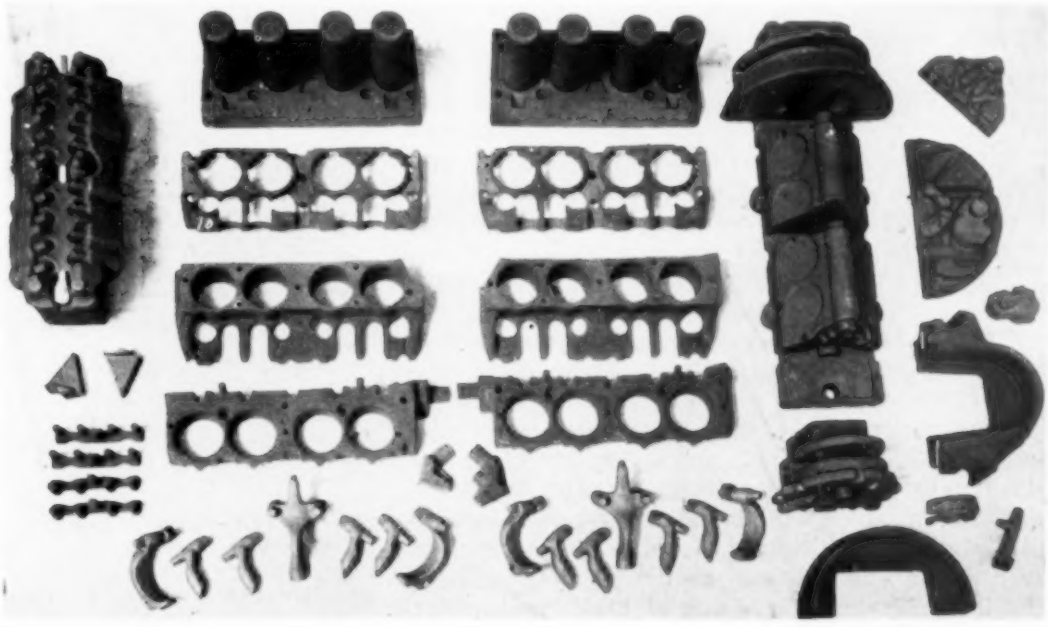


Fig. 3—Complete set of cores required to cast the V8 cylinder block

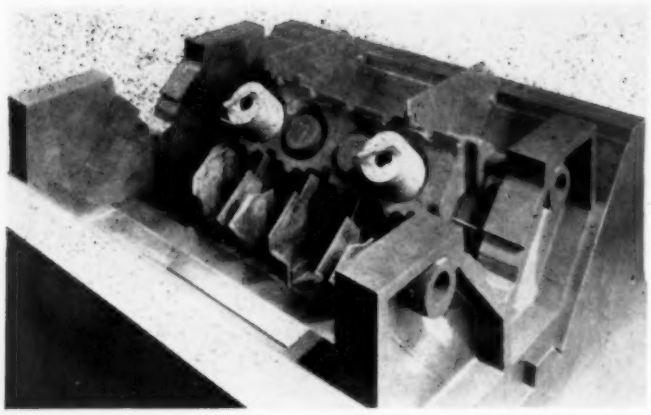


Fig. 5—Fixture for checking accuracy of the cylinder core assembly

special attention to assure easy escape of gases.

Most of the cores are wired to prevent sagging and to give sufficient rigidity to resist the weight of metal in pouring. The cylinder bank assemblies are cemented and bolted together at two points, and held at two other points by spread pins. A limited number of chaplets are employed, such as those used under the cope to prevent the complete core assembly from rising from its proper position in the drag during the pouring operation. A large fixture in the pattern shop is used for checking the accuracy of patterns and the cylinder bank and other assemblies. Metal patterns are employed throughout for all cores and in forming the cope and drag.

Apply Well-Known Assembly Plan

The progressive system of assembly, as utilized in casting cylinder blocks for the 4-cylinder engines, also is employed for the V-8. Various core assemblies and copes are assembled in and on the drags in accordance with an established procedure. Copes are sprayed and dried on an auxiliary assembly line before coming to the main line. The drags are skin dried by passing through drying ovens before the cores are put in place. After torch drying, venting, checking, etc., the copes are lowered over the drags. The fitting of the copes on the drags is so close that the pins and sockets are greased to prevent any sticking which might jar the copes when putting them in position. In casting, a head of about 30 pounds of metal is allowed above the sprue for contraction in cooling.

The iron employed for the casting is made to regular Ford grade A specifications. Its analysis is silicon 1.80 to 2.10 per cent, manganese 0.60 to 0.80 per cent, carbon 3.20 to 3.50 per cent, sulphur 100 maximum, and phosphorus 25 to 32 per cent with 15 per cent steel scrap from the machine shops. Usual procedure is for the foundry to receive the iron directly from the blast furnaces. It is brought by rail mounted ladles to 400-ton holders, in quantities sufficient for a day's supply. The metal goes to mixers, then is transferred to 15-ton electric tipping furnaces where it is brought up to the proper temperature for pouring. Cupolas are employed for melting the metal required to obtain the desired mix before it is transferred to the electric furnaces. These also are used for melting the iron when no hot metal of suitable characteristics is available direct from the blast furnaces. In either case the metal is put through the electric furnaces before pouring. From the furnaces, conveyor mounted ladles, each holding enough iron for about three cylinder blocks, are used for carrying the metal to a point near the end of the assembly line where the pouring operation takes place. (*Please turn to page* 56)

Fig. 6 (Top)—Partial assembly of cylinder barrel cores showing form and position of valve ports and templet in back. Fig. 7 (Center)—Valve house core containing oil pressure tube which is cast integral. Fig. 8 (Bottom)—Complete assembly of cylinder barrel cores

Fixed Costs 2.2 Times Prewar Level

Malleable founders pay more for freight, taxes power, insurance and depreciation than in 1914

By ROBERT E. BELT

Malleable Iron Research Institute

SOME executives in the malleable industry are of the opinion that since present prices of malleable iron are down to or below the prewar level, that costs of production can be and will have to be brought down to the level existing at that time. The purpose of this article is to list some facts which have a direct bearing on the viewpoint expressed and to present an analysis of certain important cost items which are still on a wartime level and in the reduction of which the malleable executive, as such, has no control.

Freight and Taxes Highest

The subject can be introduced best by quoting from a letter of E. E. Griest, president of the institute, who initiated the study which has been made:

In considering costs of today with those of prewar days, many members overlook the fact that freight rates and taxes are now the highest they have ever been and that should certain other cost items reach prewar levels, the cost of producing malleable castings cannot be lowered to prewar figures because important items such as freight and taxes probably will never reach prewar figures. My opinion is that labor also will never reach prewar figures, as labor rates are affected by taxes and freight costs.

It occurs to me that you could make a splendid contribution to the industry by preparing a bulletin illustrating the higher costs of production which are brought about by increased freight rates, taxes, and other items which are beyond the control of the industry. While I am sure that members realize that freight rates and taxes have been increased greatly, I doubt if anyone has figured out the relation of such items to their total costs of production.

To carry out that suggestion, a portion of the membership of the institute, selected largely geographically, was asked for information for the years 1914, 1924 and 1932, covering:

1. Freight rates per ton, from comparable points of shipment, on pig iron, malleable scrap, melting coal, annealing coal, boiler coal, fire clay, molding sand, core sand, annealing pots and fire brick.
2. Freight rates per ton on castings to principal comparable points of shipment, in carload lots and less than carload lots.
3. Fire insurance, per ton of production, on basis of normal operations, for comparable amounts of insurance in each year.
4. Employes' liability insurance, per ton of production, for comparable amounts of coverage in each year.
5. Property taxes, per ton of production, on basis of normal operations, for comparable amounts of property in each year.
6. Power and light (electric current) per ton of production in each year.
7. Depreciation, per ton of production, on basis of normal operations. for comparable amounts of property in each year.
8. Total labor costs, per ton of production (including supervision).
9. Total costs, per ton of production (including depreciation) on basis of normal operations.

The respcnse was excellent and amply sufficient to give, for the Western section, composite results which safely can be taken as representative of conditions in the industry. A composite statement of the information reported is given in the accompanying table.

Sectional Costs Are Compared

In the East, partly because of fewer members and partly due to widely different freight movements, information secured was insufficient to insure the dependability of a composite statement which would reflect average conditions of the industry in that section. However, from such information as is available, it is apparent that for the Eastern section freight on incoming materials, per ton of production, is substantially higher than that shown for the Western group; that in the East the average freight rate on castings is somewhat less than in the West, and that taxes, insurance, electric current and depreciation costs, per ton of production, are higher in the East than in the West, likely occasioned by a generally lighter class of work.

Data on comparative costs in 1914, 1924 and 1932 of items over which the malleable industry has no control in the sense that by execu-

tive direction they can be reduced are largely self-explanatory.

In the accompanying table, freight rates on the principal incoming materials used in production have been converted to costs per ton of castings by applying the rates to the quantities of the respective materials used per ton of production. On the average 3½ tons of materials on which freight is paid are used per ton of castings produced, and the average freight cost on this quantity of material, per ton of castings produced, amounted to $5.26 in 1914, $8.78 in 1924 and $9.15 in 1932. In other words, the freight cost today on incoming materials, per ton of production, is nearly twice the 1914 or prewar cost.

Freight on Castings Doubled

To the freight on incoming materials can be added the freight on castings, as the malleable producer pays the outbound freight either directly or indirectly. Assuming that one-half of the shipments were made in carload lots and one-half in less than carload lots, this amounted to $2.54 in 1914, $5.21 in 1924 and $5.25 in 1932. Freight rates on castings, therefore, have more than doubled since 1914 and the increase has been relativey greater than on incoming materials.

Adding the freight on castings to that on incoming materials gives a total freight cost in each ton of castings produced of $7.80 in 1914, compared with $14.40 in 1932. Transportation costs today, therefore, take nearly $15.00 of the per ton price you receive for your product delivered to your customer and is nearly twice the prewar figure.

Property taxes (state, county and local), on the basis of normal operations, have trebled during the period, amounting today on the average to nearly $2 per ton.

Employes' liability insurance has doubled during the period, increasing from 31 cents per ton in 1914 to 60 cents per ton in 1932.

Fire insurance, due to reduced rates of coverage, is less today per ton of castings than in 1914.

Power and light (electric current), on the other hand, shows a relative increase greater than that of freight and nearly equal to that of taxes, a substantial part of the higher cost having taken place during the last 8 years.

Depreciation Is Included

Depreciation on plant and equipment has been included with the other so-called costs over which the industry has no control. It is true that executives can, at will, include or exclude depreciation as an item of cost, but whether or not it is currently reckoned with, depreciation is marching on unceasingly and eventually values have to be restored, if not from a drepreciation reserve, from capital. Depreciation, therefore, constitutes a fixed charge over which one has no control. On the basis of normal operations, depreciation of the reporting plants averaged $2.14 per ton in 1914, $4.91 in 1924 and $5.85 in 1932. The increase here is approximately parallel to that in other items shown and is accounted for not by increased depreciation rates, but by higher postwar property values.

The total of the foregoing so-called costs over which the industry has no control, namely, freight, taxes, insurance, electric current and depreciation, amounted to $12.63 in 1914, $24.16 in 1924 and $26.55 in 1932, an increase over the prewar level of 110 (*Please turn to page* 57)

Freight, Taxes, Insurance Electric Current and Depreciation Per Ton of Malleable Castings

1914, 1924 and 1932

(Central District—Ohio, Michigan, Indiana, Illinois and Wisconsin)

	Tons of Material per ton of Castings	Freight Rate Per Ton			Cost Per Ton of Castings		
		1914	1924	1932	1914	1924	1932
Freight Costs on—							
Pig iron (G.T.)	0.90	$1.37	$2.26	$2.42	$1.23	$2.03	$2.18
Malleable scrap (G.T.)	0.10	1.16	2.05	2.29	0.12	0.21	0.23
Melting coal	0.88	1.56	2.59	2.94	1.37	2.28	2.59
Annealing coal	0.45	1.47	2.45	2.50	0.66	1.10	1.13
Boiler coal	0.20	1.47	2.45	2.50	0.29	0.49	0.50
Fire clay	0.04	1.31	2.26	2.30	0.05	0.09	0.09
Molding sand	0.22	1.30	1.95	1.92	0.29	0.43	0.42
Core sand	0.35	1.28	2.14	1.95	0.45	0.75	0.68
Annealing pots	0.16	2.20	4.60	4.17	0.35	0.74	0.66
Fire brick	0.20	2.25	3.32	3.38	0.45	0.66	0.67
Total	3.50				5.26	8.78	9.15
Freight rate on castings—Carload		2.01	4.02	4.20			
—L.C.L.		3.07	6.40	6.30	2.54	5.21	5.25
Total freight costs on materials and on castings					7.80	13.99	14.40
Proper Taxes (basis of normal operations)					0.65	1.66	1.97
Employees' liability insurance					0.31	0.63	0.60
Fire insurance (basis of normal operations)					0.40	0.45	0.32
Electric current					1.33	2.52	3.41
Depreciation of plant and equipment (basis of normal operations)					2.14	4.91	5.85
Total freight, taxes, insurance, electric current and depreciation					12.63	24.16	26.55

Hall of Science, as it neared completion. Here the wonders of science and the industries related to it will be displayed

A. F. A. Picks Chicago for 1933

Association will meet at Stevens hotel during A Century of Progress international exposition

CHICAGO has been selected as the scene of the 1933 foundrymen's convention.

A recent announcement of C. E. Hoyt, executive secretary, reveals the decision of the directors of the American Foundrymen's association to join with other leading engineering and technical societies in holding meetings in the midwest metropolis during the A Century of Progress exposition, which opens on June 1, 1933. All A. F. A. activities will center in the Stevens hotel, where several previous successful conventions have been held.

Probaby the greatest educational and entertainment program ever available for those attending the conventions of the A. F. A. will be staged during the week of June 19. Of first importance is the technical program, including shop operation courses and round table discussions, now being arranged by R. E. Kennedy, technical secretary of the society, and which promises to be unusually attractive. Of equal moment is the exhibition of foundry equipment and supplies to be held in the exhibition hall of the Stevens hotel.

Many leaders of the scientific and engineering world will be in Chicago during the A. F. A. convention week, since that period has been designated as Science Week by the A Century of Progress management. Special one day programs will be held on the many ramifications of applied science and engineering, and the American Foundrymen's association is co-operating with committees of various scientific and engineering societies in arranging programs which will be international in interest and participation.

As previously announced, the annual meeting of the American Society for Testing Materials will be held in the Stevens hotel the week of June 26, or immediately following the A. F. A. convention. Officers of the two important organizations are co-operating in the preparation of an overlapping program which will be of practical interest to foundrymen and engineers alike. In addition to the A. S. T. M. meetings touching upon castings practice in general, the two societies have arranged for two joint symposiums, one covering methods of testing castings, which probably will be held the latter part of the A. F. A. convention week, and the other on gray cast iron, which will feature the early part of the A. S. T. M. meeting.

Last to be mentioned, but probably not the least in interest, is the A Century of Progress international exposition, which, it is pointed out will be a colossal demonstration of the development of industries that have contributed so strikingly to mankind's comfort and progress. Rufus C. Dawes, president of the exposition, has summarized its basic theme as one which "dramatizes the achievements of mankind, made possible through the application of science to industry." Foundrymen will be exceedingly interested and justifiably gratified in the part that castings of all classes have played in the development.

Buy for Rehabilitation

Every solvent manufacturer has vital interest in well timed replacement program

By EARL L. SHANER

THROUGHOUT the nation in recent weeks numerous prominent executives of finance and industry have been appearing before groups of business men for the purpose of enlisting their co-operation in a battle against the depression. Their work is so closely related to the interests of every producer and manufacturer in the United States that it is important that their objectives be understood thoroughly, and that the co-ordination of the various agencies engaged in this movement be made clear. That is the purpose of this discussion.

Early in the summer so-called banking and industrial committees were formed in the federal reserve districts. On Aug. 26 these committees held a conference in Washington with President Hoover, at which time a central banking and industrial committee was formed with Henry M. Robinson of Los Angeles as chairman. Concurrently five subcommittees were established, as follows:

1. Committee to make available credit more affirmatively useful to business.

2. Committee to increase employment on railroads through expansion of maintenance and purchase of equipment.

3. Committee to stimulate the expansion of capital expenditures by industry through replacement of obsolete and worn out equipment.

4. Committee to stimulate the repair and improvement of homes.

5. Committee to increase employment through the sharing of work, possible by adopting shorter shifts.

Each subcommittee may be likened to an army corps charged with the task of waging an offensive on a definite front. The first-named committee, under the chairmanship of Owen D. Young, has for its objective the distribution of credit into the channels of industry and trade. There has been criticism that the money loaned to banks by the Reconstruction Finance Corp. has not been passed on to business as promptly or as freely as is desired. Mr. Young's committee is trying to clear the way so that funds of the corporation may flow quickly to the spots where it can be used most readily for business recovery.

EARL L. SHANER, editor of Steel and president of the National Conference of Business Paper Editors, in an able address presented at the meeting of the Foundry Equipment Manufacturers association held in Cleveland, Oct. 13, outlined some vital facts relating to industrial rehabilitation. The foundry industry occupies a dual position. While large users of mechanical equipment, foundries are basically interested as manufacturers in the production and marketing of all types of machinery. Mr. Shaner's address explains the nature of the national rehabilitation movement now under way.

The committee on railroad purchases is functioning under the joint chairmanship of Daniel Willard and George H. Houston. To understand its role in the complicated railroad problem, one must review the status of several other agencies.

Shortly after the Reconstruction Finance Corp. was formed it made a number of large loans to railroads, in each case after approval had been granted by the Interstate Commerce Commission. The majority of these loans were used by the roads for refinancing bonds or other indebtedness. A notable exception was a loan to the Pennsylvania Railroad Co. to enable it to resume work on its electrification project between New York and Washington, which work previously had been abandoned due to lack of funds.

A few days after the Willard-Houston subcommittee was formed, various groups interested in the railroads established the Railroad Equipment Financing Corp. Through this

intermediary agency and with the approval of the Interstate Commerce Commission, funds from the Reconstruction Finance Corp. may be made available for railroads desiring to purchase or repair equipment. Thus far the Pennsylvania Railroad Co. has received $2,000,000 and the Baltimore & Ohio railroad $3,000,000 to enable them to purchase or build cars. Several other roads have asked for smaller amounts to permit them to repair rolling stock in their own shops.

One of the most important of the subcommittees is that on sharing work, which is headed by Walter C. Teagle. Here the need is imperative and the results more immediate and more tangible than those of the other four committees. Realizing that even under the most fortunate circumstances that can be expected, the approaching winter will find unemployment at a high level, Mr. Teagle and his associates are trying to persuade employers to spread work wherever possible, to distribute wage dollars.

The subcommittee on stimulating the repair of homes is headed by Sewell L. Avery and Clarence H. Woolley. Its activities are directed toward rehabilitation in homes.

Push Industrial Rehabilitation

We now come to the subcommittee on industrial rehabilitation, of which A. W. Robertson is chairman and E. T. Weir, vice chairman. The work of this agency is of direct interest to every industrial executive. Its primary objective is "to set in motion a succession of orders for improved equipment and machinery which will extend, in their effect on employment and spending, from the factory back to the farms, forests and mines. Every order starts a wave of work required in the production, processing, transportation, installation and sales of materials and services that is felt throughout all branches of business."

There is nothing new about this idea. The desirability of ridding industry of obsolete methods and equipment has been advocated vigorously throughout the past decade or more. On several occasions during the present depression, serious attempts have been made to launch drives urging industry to rehabilitate its plants. But, while the idea was recognized as sound, leading executives were unwilling to lend their support until such time as business conditions were favorable. They felt that as long as industrial activity was declining and the general policy of good management was intelligent retrenchment, it would be futile, if not absurd, to ask companies to purchase new equipment.

Today the situation is different than it has been for many months. Since the last week of June, the turn in commodity prices, the response in the securities markets, continued expansion in freight car loadings, improvement in electric power output, a steady but moderate rise in steel output and favorable signs registered by many other barometers of business have convinced the majority of executives that the tide has turned.

As a result of this improvement, the attitude of management is undergoing an important change. Until a few months ago retrenchment was the watchword of careful management, today the trend is toward reconstruction.

Self Interest the Motive

It is to these fortunate companies—the ones that are prepared now to rebuild their businesses—that the Robertson committee is directing its initial attention. It is urging them to act solely from the motive of their own self interest. The very latest equipment developed in the last three years can be purchased at abnormally low prices. Many corporations have liquid funds drawing low interest that would be better invested in more efficient plant facilities. Improved equipment, purchased advantageously, will improve a company's ability to meet competition and thereby increase its earning power. Changes can be made now with the least interruption to operations. These facts persuade executives to act in their own interest.

The committee also has to cope with the natural inertia of industry. Every day at luncheon executives discuss company policies informally. If we could listen in on these conferences we would find hundreds and perhaps thousands of cases where managements are thinking in terms of expansion instead of retrenchment but are reluctant to take the first step forward. "Let's wait until the big companies do something," is a common expression reflecting the present attitude.

Mr. Robertson's committee recognizes this situation and consequently is trying not only to encourage leading companies to set examples for others to follow, but also to induce many companies to go forward in unison. Evidence of the first activity is found in the announcements by several large corporations in recent weeks that they are appropriating large sums for modernization. The second activity—that of getting a mass movement started—is provided for in the functioning in each federal reserve district so that the influence of this agency will be felt throughout every section and in every industry.

The effort launched through the Robertson committee is essentially a *buying* movement. It is stressing the purchase of capital goods in the self interest of the purchaser as a step in releasing orders and furnishing employment which in turn will stimulate activity in other fields, the purchasers' included.

Therefore every producer and manufacturer has a dual role in the campaign. As a consumer of materials and a user of equipment he is urged to buy if it will serve his interest. At the same time, as a seller he should follow in the wake of the committee's drive and *sell as he has never sold before.*

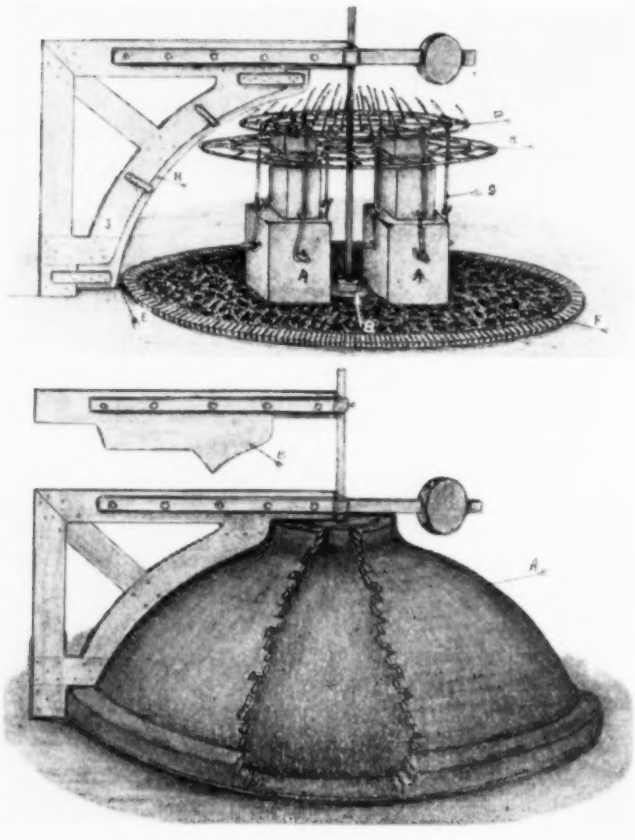
Loam Mold for Large Steel Casting

Requires study of design, pattern equipment, molding and pouring methods, gates and risers

By H. V. FELL
Sheffield, England

FOR the benefit of aircraft manufacturers and to insure the rejection of defective materials, various component parts of airplanes now are subjected to a severe series of tests in a variable density chamber where artificial conditions are generated to stresses much more severe than those encountered in actual service.

This chamber or tunnel, is made up of four rolled steel drums and four castings. Two of the castings have been selected for illustration one in this and one in a succeeding article. Overall dimensions of the assembled tunnel include: Length 50 feet; outside diameter of the flange 19 feet; inside diameter 17 feet; total weight 250 tons. The weight of each end piece casting as shown in Fig. 7 is 35 tons.



From top to bottom—Fig. 1—Drawing showing location of spindle socket, cross girders, iron weights, grids or arbors and the brick bed. In practice, the grids, C and D would be located after the core had been built up to the required height for each. Fig. 2—At the required height a circular joint is formed with the sweep B

Before actual foundry work begins on castings of this character it is apparent that careful thought and attention to detail are essential. Every possible contingency must be visualized in advance and proper provision made for the construction of the mold and the manipulation of the metal, first in the molten and later in the solid condition. The chief points requiring attention in advance are: Design, contraction allowance, gates, feeders, pouring methods, pattern equipment and molding methods to be adopted.

Consult on Design Features

In the preliminary stages, a general outline of the design and dimensions of the proposed castings was submitted to the foundry executives for their consideration and approval. As a result of this discussion, an increase of ½-inch was added to the body thickness between the two extremely thick sections *A* and *B*, Fig. 7 to insure greater uniformity of section. In the initial stage, the lifting lugs as shown by the dotted line at *C* and *C* were considered too large to guarantee soundness at the base. The designer agreed to have them reduced in size as shown.

At this point it is interesting to observe that the contraction allowance on these large castings was 5/32-inch per foot and that in nearly every dimension they came out of the molds exactly to specifications. As a precautionary measure a machining allowance of 1-inch was placed on the faces *A* and *B*, Fig. 7. These areas are shown to better advantage in another illustration, to appear in the second of these two articles. Instead of constructing patterns for these castings, it was decided to employ sweeps and core-boxes.

Before setting up the spindle socket *B*, Fig. 1, cross girders were placed in position and hooks were adjusted for attaching the binder bolts designed to hold the cope from lifting during the

casting operation. A substantial brick bed was laid in the usual manner with adequate vent channels leading to the outside.

Iron weights *A* then were lowered into place. They helped to hold the spindle base or socket *B* and also served as an anchorage for the grids or arbors *C* and *D*, the skeleton or support for the crown of the dome. To obviate any possible misunderstanding it must be explained that Fig. 1 was drawn in this manner to explain the dual use of the iron weights or blocks. In the actual construction, of course, the grids *C* and *D* only were located after the core had been built up to the required height for each one.

In Fig. 1, it will be noted that the sweep or strike board *J* is designed to form the core or inside part of the mold and also to form the outside of what corresponds to a pattern for building the cope. This double purpose is accomplished by fastening the piece *H*, which corresponds to a vertical section of one half the proposed casting, to the curved face of the sweep.

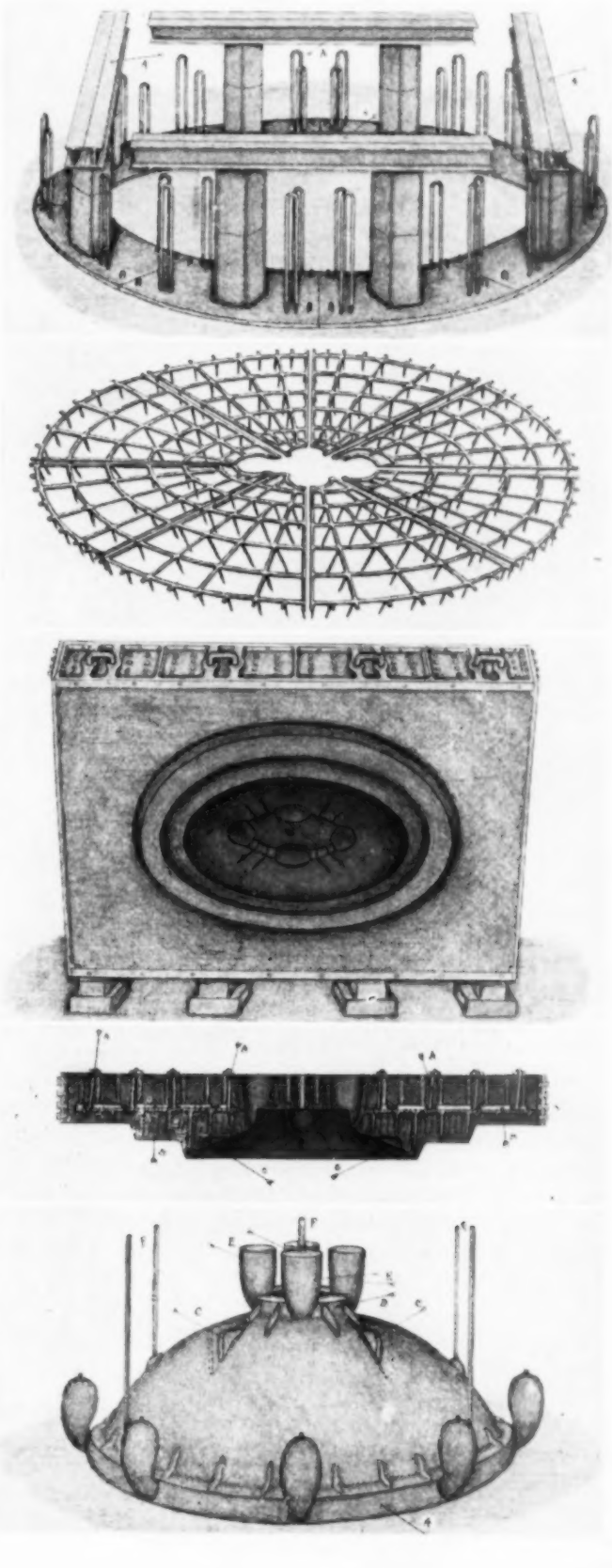
Build Supporting Structure

With the sweep adjusted properly and swinging clear on the lower and outer end designed to form a small step or guide later in building what corresponds to a pattern in ordinary practice, a ring of loam brick was laid approximately 1½ inches inside a circle struck by the simple expedient of holding a long spike or the tang of a file against the inner edge of the sweep and pulling the sweep around.

The space inside the ring was filled with loose brickbats and cinders and the outer wall was carried up in successive tiers of loam brick, each tier kept back a uniform distance of 1½ inches from the cutting edge of the sweep as shown at *E*. At the proper height, the grids *C* and *D* were secured by the long hooks *G* and then the remainder of the core was built up to the top. The face was given a coat of claywash followed by a thickness of steel foundry compo, a name applied in British steel foundries to the material used in facing dry sand molds. This material was packed on to a thickness slightly in excess of the 1½ inches required and then was reduced to a proper and uniform thickness by revolving the sweep. In this operation the trowel was used freely ahead of the sweep to reduce the amount of resistance against the face of the sweep. A sweep board of that size and shape easily may be broken or distorted if employed as a scraper where an excessive amount of material has to be removed.

After the face on this part of the mold was nailed to prevent it from scabbing or washing during the entrance of the metal, it was given a final coating of sieved compo settled into place by revolving the sweep in the opposite direction from that formerly employed. The face then was given a coating of refractory paint and sleeked and then allowed to harden before the next step in the process was undertaken.

The pattern piece *H*, Fig. 1 was removed and a layer of loam bricks (*Please turn to page* 58)



From top to bottom—Fig. 3—Assembly of drawplates as it would appear without bricks. Fig. 4—A large grid or arbor in eight sections. Fig. 5—Top part of the mold lifted off. Fig. 6—Arbor suspended from the bars of the cope by suitable hooks. Fig. 7—Four large feeders or shrink heads are used

Through the Years with

THE FOUNDRY

AFTER languishing for several years, the foundry industry experienced a decided pickup in the latter part of 1898. The volume of business increased steadily all through 1899. This gratifying feature was commented upon editorially in the February, 1900, issue. The statement also served to emphasize the optimistic spirit of the publication, a spirit responsible for its establishment and an abiding faith in the importance and necessity of the foundry as a great basic industry:

"We are completing the most prosperous and in all respects the most remarkable year in the history of the American iron trade. We are about to enter a year which will be quite as interesting and, unless all signs fail, even more prosperous. The change we have passed through is little less than a revolution. Ten years ago the cost of American iron and steel was higher than in England or in Germany. We did not even supply our own requirements, but were importing raw and finished materials in substantial quantities. Mechanically we were superior to our competitors, but we had not conquered our own problems and were far from leadership of the world. The Baring failure in 1890 started prices downward. The panic of 1893 did the rest. Then followed 6 years of as hard experience as a great industry ever passed through. Capital was wiped out by the millions. Furnaces and mills that were counted valuable properties a few years ago became liabilities rather than assets.

Kissing the Rod of Depression

"Out of this period of storm and stress came the new era of American iron and steel making. Mechanically as well as commercially the whole industry underwent a revolution. Necessity not only compelled economies, but aroused American energies and ingenuity and forced better methods of manufacture. Those who still had capital, and who had confidence in the future, replaced old plant with new, built everything stronger and heavier and on the most modern lines. Resources of raw materials were developed and transportation problems worked out. At the end of the lean years, the American iron trade had been stripped of every element of weakness and was in splendid position to take advantage of the changed times. The terrible depression had been a blessing in disguise.

After commenting on the remarkable rise in the price of all commodities and the enormously increased consumption, the writer concludes with the remarkably significant prophecy:

"Looking at the whole field, surely there is a superb opportunity before the iron and steel trades of America in the opening year of the new century, and there are possibilities for the years to follow with which the imagination hardly can deal."

Taking pig iron as the barometer of trade, the production of this material almost doubled in the succeeding 10 years. From a production of 15,000,000 tons in 1900 the output of the blast furnaces had risen to nearly 30,000,000 tons in 1910 and to 45,000,000 tons in 1930.

Increases in Tonnage Output

Pessimistic statistical experts who point with alarm to the fact that the total number of foundries operating in 1932 is only slightly greater than the number in existence in 1900 overlook the important fact that a foundry melting 100 tons of iron per day at the turn of the century constituted the exception rather than the rule. In recent years the melting capacity of some of the specialty shops has crept up to 400 or 500 tons per day with a maximum in a few instances of over 2000 tons.

Another interesting feature in this connection is that five states, Illinois, Michigan, New York, Ohio and Pennsylvania, now as then account for approximately 50 per cent of the nation's output in castings.

Continuing its original policy of serving directly the men actively engaged in the actual production of castings, THE FOUNDRY in the period between 1899 and 1907 presented a wide variety of short practical articles on practical problems designed to acquaint the reader with knowledge over a wide field. These articles found favor with readers and were clipped and bound in scrap books or in indexed files for future reference. Many a budding young foundry foreman and superintendent found a solution for his early problems in these published shop kinks and experiences.

THE FOUNDRY presented an open forum where foundrymen discussed the problems of their trade. Many of the men whose names appear in this early correspondence attained positions of importance and responsibility in later years. In

many instances THE FOUNDRY directly or indirectly was responsible for their success through the opportunity afforded them to bring themselves before the foundry personnel, and to become known in the industry.

In 1900 THE FOUNDRY continued to direct attention to the importance of sand and the necessity of formulating some intelligent method of grading this material. Without doubt the publicity given this subject for many years in the columns of THE FOUNDRY was responsible for the concerted action taken later by the American Foundrymen's association in appointing a committee to study this subject from a scientific and practical standpoint.

The almost endless ramifications of the subject is indicated by the fact that although the various subcommittees have worked incessantly, the work is not yet completed. THE FOUNDRY has broadcast all the findings and developments, all the tests and rules formulated for the benefit of foundrymen in selecting sands suitable for their requirements and in maintaining their sand in proper condition.

In the era of prosperity following the turn of the century, certain predatory individuals appeared, get rich quick gentlemen with alluring schemes for increasing the wealth of foundrymen who might avail themselves of their methods and materials. On several occasions THE FOUNDRY warned its readers against specific dealers in fakes and nostrums, designed—according to the purveyors thereof—to purify and communicate marvelous qualities to their castings. A strict censorship always has been exercised over the advertising pages of THE FOUNDRY, and only legitimate items that will bear the closet scrutiny, have been admitted. Interest in and welfare of foundrymen guide all policies.

In the bicycle parlance of the day THE FOUNDRY completed its first century with the December, 1900, issue. In other words the hundredth monthly number was issued. Efforts up to that time, also aims and aspirations for the future were set forth in an editorial on the front page. The statement is just as apropos now as it was then or at any period in between:

"With the present issue is completed the hundredth number of THE FOUNDRY. A hundred months is a short time and yet how many of our readers can say that they have not witnessed great changes in that period. Some may say that molding is molding the world over and that foundry practice differs but little in one country from that of another. That statement is only partially true. Every foundry uses sand and metal to make castings, but what a difference in the manipulation of materials!

"One foundry will turn out three times the product per man of another shop. In the shop which turns out the least, the men may work the hardest. Management—other things being equal—is the most important factor. So far as results are concerned, the best workmen in the world become incompetents in the hands of a manager who has not the ability to direct their efforts."

Cover from the convention issue of The Foundry, July, 1900, reproduced in miniature

In the light of subsequent history—always an advantageous position—the foregoing statement presents two interesting features. Perhaps it would be more accurate to say *an* interesting feature, since the second feature really is a corrollary of the first. The statement indicated the intimacy which existed between THE FOUNDRY and the industry. It also showed an almost uncannily prophetic vision on the part of the editor in foreseeing the mechanised era into which the foundry was moving. Instead of lagging at the tail end of the procession, a feeble echo of what had been accomplished, THE FOUNDRY always has been in the vanguard, a valiant trumpeter in the march of progress of the entire industry dealing with the manufacture, and distribution of castings.

Evidence of the great increase in foundry activity is shown in the statistics for 1902. Plants projected or actually under construction numbered 462. This represented an increase of 7.68 per cent on the total number of foundries in the United States and Canada at that period.

Marks Progressive Trends

Even if many of these foundries simply replaced older and out dated units, it is only reasonable to infer that the total foundry capacity was increased to a considerable extent. The tendency then even as now was in the direction of larger and better equipped plants with economy and efficiency governing.

The greatest surprise of the year was disclosed in the large number of steel foundries projected or actually placed in operation during the year 1902. From 73 plants listed at the beginning of the year the number had increased to 93. Prosperity in the malleable iron branch of the industry was reflected by the addition of 10 new plants to those already in existence. Production of steel (*Please turn to page* 57)

Iron for Pressure Castings

Melt steel and soft iron in separate cupolas and mix to proper proportions in the ladle

By H. H. JUDSON

Goulds Pumps, Inc., Seneca Falls, N. Y.

SIX years ago a series of experiments was conducted in our foundry to develop a high-strength iron that would be suitable for fluid ends of high-pressure pumps, especially the ends of oil-line pumps. These fluid ends or cylinders are heavy castings weighing from 2000 to 3000 pounds each. Wall thickness varies from 1½ to 2½ inches, the average thickness being 2¼ inches; internal sections are much heavier. This gives a slow-cooling casting, which under our old methds, was prone to develop internal shrinks or draws.

The principal purpose of these experiments was to determine what effect the various common elements occurring in cast iron had upon the strength of the castings. The series included heats made up of different burdens, all of which contained steel rails but with various amounts of malleable pig, charcoal pig, low-silicon pig, and alloys of nickel and chromium.

Cylinders were cast from these heats and then were machined and tested to destruction. The average bursting pressure was in the neighborhood of 3500 pounds per square inch. Tensile tests performed on samples cut from the walls of these cylinders showed a tensile strength of from 30,000 to 35,000 pounds per square inch. Chemical analyses showed a range of silicon contents from 0.8 to 2 per cent, manganese from 0.5 to 1 per cent, and total carbon from 3.10 to 3.40 per cent.

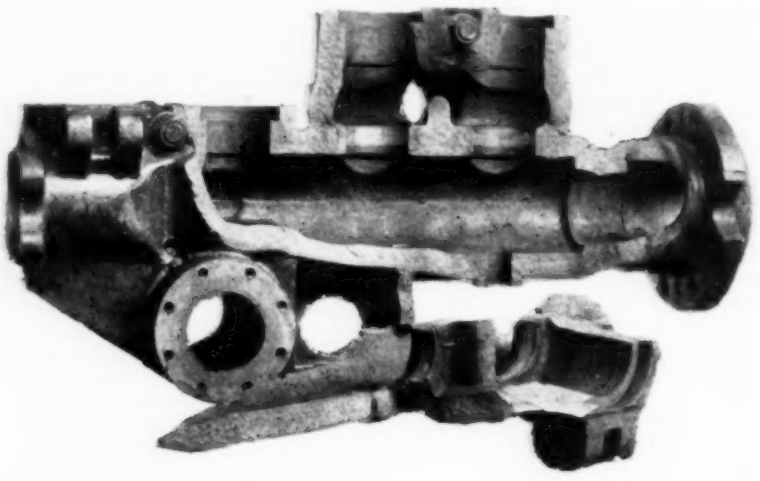
The physical test results were not sufficient to meet the needs of the engineering department. However, an analysis of results of various tests showed that the one element having greatest effect on desired properties was carbon. Both the percentage of total carbon present and the condition in which it existed in the casting were of equal importance. Results from the alloy heats were not uniform, owing to lack of knowledge, at that time, of the proper use of these alloys and the interpretation of the data obtained.

The fact that carbon is so important an element, insofar as strength and pressure tightness are concerned, was not new. Experimental heats proved conclusively that it had, above all other elements, the most profound effect on these properties. The lower the total carbon and graphitic carbon, within certain ranges, the stronger and finer grained was the resulting iron. Hence, the problem resolved itself into one of reducing the total carbon content and controlling it.

Add Steel to Lower Carbon

In the cupola, the one simple means of reducing the total carbon of a cast iron mixture is by the use of steel rails in the burden. Steel rails always had been used in the regular so-called semisteel mixtures, and their use was continued.

Since it was so desirable to reduce and also to control the carbon content, and since the use of steel rails in the burden was a means to that end, it was decided to melt the rails in a separate cupola. This would produce an extremely hard iron, unsuitable for casting. The softening materials then would be melted in another cupola and the two irons mixed in one ladle. An ex-



Typical break on bursting pressure test of line pump cylinder cast with two cupola irons

perimental heat was run according to this method, and such excellent results were obtained that the idea was developed until it was practicable in production.

Test bars from these early heats were not of much value. The cooling rate of the separately cast test bars was so much faster than that of the cylinders that, although bars and cylinders were of the same chemical composition, the mechanical properties of the iron in the test bars were widely different from those of the iron in the cylinders.

To have a more accurate measure upon each heat an extra cylinder was cast, machined and tested to destruction under hydrostatic pressure. This test proved to be costly, so a test cylinder was designed of the same wall thickness and general proportions as the pump cylinder but with necessary machining reduced to a minimum. One of these cylinders was cast with each heat and broken under pressure during the remainder of the series.

Mixture Raises Resistance

The cylinders from an ordinary semisteel heat, cast during the original investigation, would develop a bursting strength up to 3500 pounds per square inch. The same type of cylinder cast with two-cupola iron would develop a bursting pressure of 6000 pounds per square inch. The accompanying illustration shows a typical break, on a bursting test, of a line-pump cylinder cast with two-cupola iron. Wall thickness of this cylinder as may be observed is fairly uniform throughout and averages 2¼ inches.

Table I

Physical Properties of Iron

Tensile strength, pounds per square inch	46,500
Shear strength, pounds per square inch	51,500
Brinell hardness	212
Bursting pressure, pounds per square inch	6,000
Transverse Tests (on standard 1¼-inch round arbitration bars on 12-inch centers):	
Transverse strength, pounds	5,000
Transverse deflection, inch	0.09

Table II

Range of Mixtures Used

Cupola Charges:	
Steel rails, pounds	1300 to 1500
Silicon pig, pounds	120 to 140
Spiegeleisen, pounds	65 to 80
Soft Iron:	
Silicon, per cent	2.40 to 2.70
Sulphur, per cent	0.035
Manganese, per cent	0.50 to 0.70
Phosphorus, per cent	0.45
Total carbon, per cent	3.40 to 3.60
Weights:	
7000 to 8000 pounds hard iron.	
1800 to 2300 pounds soft iron.	
Resultant Mixtures:	
Silicon, per cent	1.40 to 1.80
Sulphur, per cent	0.10 to 0.11
Manganese, per cent	0.85 to 1.10
Phosphorus, per cent	0.150
Total carbon, per cent	2.40 to 2.80

Table III

Analyses of Hard-Iron Samples

(Samples taken from spout at 5-minute intervals during short heat, all tapped into one ladle.)

Sample No.	Si	S	Mn	P	TC
1	1.07	0.128	0.53	0.080	2.62
2	2.06	0.090	1.44	0.078	2.50
3	2.22	0.082	1.78	0.042	2.40
4	0.91	0.096	0.85	0.067	1.70
5	0.33	0.085	0.97	0.082	2.73

The method finally evolved is as follows: Steel rails, with some spiegeleisen and high silicon pig, are melted in a cupola lined to 54-inch diameter. One row of tuyeres, set from 7 to 8 inches above the sand bottom, is used. The tap is continuous and the spout is of the skimmering type. The coke bed extends 34 inches above the top of the tuyeres, and the charges used are as follows: Steel rails, 1300 to 1500 pounds; 15 per cent silicon pig, 120 to 140 pounds; 20 per cent speigeleisen, 65 to 80 pounds; coke splits, 180 pounds.

Blast is supplied by a motordriven, positive displacement blower, and the blast is measured by a volume-recording blast meter of the orifice plate type. The blast volume runs between 5400 and 5600 cubic feet per minute with a pressure starting at 14 ounces and dropping gradually to 6 or 8 ounces at the end of the heat. Blast volume is held between the stated limits throughout the heat by manual control of the blower motor.

The 54-inch bed is burned through completely, a rule adhered to religiously. Then the steel rails, with the speigeleisen and high-silicon pig, are charged carefully by hand. Each charge is kept as level as possible.

Allow Charge to Soak

The cupola stands, fully charged, for an hour and a quarter with the tuyere covers opened wide so as to provide a strong natural draft. The blast is started and the time noted when iron drips past the tuyeres, which usually is 5 to 6 minutes after blast-on. Tap-out comes 6 minutes after these drops are first seen, and an optical pyrometer indicates an apparent temperature of 2550 degrees Fahr. with no correction for emissivity. All the metal is tapped into one ladle.

In the meantime, the cupola melting the soft iron has been in blast. A ladle suspended from a crane scale is placed under the spout and a predetermined weight of soft iron is tapped. It then is poured into the ladle of hard iron from the 54-inch cupola. When sufficient iron has been caught to make the desired mixture, the molds are poured. The accompanying tables give data on mixtures, charges, analyses and the resultant properties. (*Please turn to page* 54)

A portion of the equipment section showing a variety of the machinery displayed

Machines Feature Paris Display

Equipment from many countries shown at exhibition held during foundry congress

By VINCENT DELPORT
European Manager, The Foundry

THE foundry exhibition staged in Paris, Sept. 3 to 18, during the Fourth International Foundry congress, also was international in character. Special sections were organized by Belgium, Italy and Spain, in which exhibits of those countries were grouped. A number of exhibits also originated in Czecho-Slovakia, Germany, Great Britain and the United States; but in many cases the equipment shown was on the stands of the representatives or agents of the foreign makers. It was opened by the French minister of commerce and industry, and was organized by the Syndicat General des Fondeurs de France, under government patronage.

Technical Groups Show Work

An important feature of the exposition was the section devoted to technical exhibits from the principal technical schools of France, including the Ecole Centrale des Arts et Manufactures, the Ecole Nationales d'Arts et Metiers, the Ecole Superieure de Fonderie, and others. Exhibits were included from the foundry institute of the technical university of Aix-la-Chapelle, Germany, from the academy of Freiberg, and from the technical school of Karlsruhe. The polytechnic school of Brno, Czecho-Slovakia, the technical high school of Zurich, Switzerland, and the Belgian technical institutions also were represented.

The exhibits included charts, photographs, test-pieces, castings and patterns made by the students of the various schools and academies. An exhibit of laboratory equipment supplied by the Conservatoire National des Arts et Metiers, the French foundry research center at Saulnes, the German centers of research, and the British Cast-Iron Research association was included. Literature contributed by the American Foundrymen's association also was displayed. A special section was reserved for the technical press, where copies of technical books and various papers relating to the foundry and asociated industries in France, Germany, Great Britain and the United States were exhibited, and which included THE FOUNDRY and the publications of the Penton Publishing Co., Cleveland.

In all, there were about 500 exhibitors and stands; but the greater part of the space occupied in the Exhibition grounds at the Porte de Versailles, Paris, was given up to castings of every description, including artistic work. A number of stands were occupied by displays of

raw materials, including fuels, ores, ferrous and nonferrous metals, refractories, sands, blackings, etc. An important section was devoted to foundry plant and equipment, and the following remarks relate to the most outstanding novelties.

In the foundry plant section, Badische Maschinenfabrik, Durlach, Germany, had a sand-preparing and molding station in working order. This included a complete sand preparing plant for mixing sand, a humidifier, disintegrator, and necessary equipment for handling by bucket elevators, etc. A number of molding machines of various types, also manufactured by the company, were shown, including machines combining jolting and squeezing, which were somewhat a feature of the exhibition, as machines of similar type were displayed on other stands.

Alfred Baillot & Co., Saint-Ouen, near Paris, specialists in sand-preparing plant, also showed an automatic plant in working order, including a continuous sand mill with revolving pan 7 feet 8 inches in diameter and capable of delivering from 8 to 15 tons per hour. This mill is equipped with three rolls, two of which are grooved, the third being smooth.

Show Working Foundry Model

Establissements Ph. Bonvillain et E. Ronceray, Choisy-le-Roi, near Paris, arranged a complete model of a foundry in working order, with semiautomatic sand plant embodying a mill in which the pan is a flat disk. Rolls are characterized by their width, and a set of scrapers is so arranged that the sand is passed from the center to the circumference of the operating disk, after having been treated by the rolls. Delivery is performed by the outside circumference of the pan, while the sand is fed into the center of the mill by a small belt conveyor having a vibrating screen at the lower end.

A recent molding machine, which combines jolting and squeezing with a special bottom sand-frame also was on that stand. Operations of that machine are simultaneous. The pattern is imprinted into the molding sand during the forward course of the piston, on which the table is fixed, and stripping is effected during the return course of the piston. The jolting movement can be regulated and reduced to a simple vibratory action.

Establissements Fenwick Freres, Paris, showed a number of molding machines by Gustav Zimmermann, Dusseldorf, one being a machine combining jolting and squeezing, the jolting being effected at the same time as the pressure is exerted between the mold and the pattern. It is claimed that this machine has no trepidations, and it can be used with plaster-of-paris patterns, and also for casting a number of identical pieces simultaneously in one mold. On the same stand were displayed some Royer-Fenwick disintegrators and separators, and a complete working example of the Rosieres-Bachon continuous molding plant for large flat castings, which plant was described in THE FOUNDRY, May 15, 1929. The firm of Fenwick Freres also showed films of the operation of Beardsley and Piper sandslinging machines for which they have a license in Europe.

A working model of the rotating forehearth used in the Girardet process was exhibited by L'Outillage de Fonderie, Paris. That firm also specializes in other ranges of foundry plant, particularly drying ovens and sand-preparing plants. The principle of the Girardet system already has been described in THE FOUNDRY. By giving an eccentric rotating movement to the forehearth, which collects the molten iron, it is claimed the resulting metal is more homogeneous, with a finer grain and more disseminated graphite.

Increase Oven Heating Area

Societe Anonyme des Ateliers Ivan Lamoureux, Sclessin-lez-Liege, Belgium, exhibited a drying oven heated by coke, in which the sides of the hearth are corrugated to offer a greater area for heating. There was also a special device for tilting large ladles of 2½ tons.

An arc-electric furnace was exhibited by Siemens-France, of 17, Rue de Surene, Paris, while a rotating furnace of a modified Brackelsberg type and fired by fuel oil was shown on the stand of Societe des Fours et Appareils Stein.

An automatic control box for electric furnaces by Ing. P. L. Tagliaferri, Genoa, was shown on the stand of the Italian section.

Albertuswerke, Hanover, Germany, displayed a machine for making cores by compressed air. In this machine a brass cylinder moves along a horizontal axis, and in its forward movement in a sand box it becomes filled with sand. At one end of its course a current of compressed air chases and compresses the sand into the core box. Another core-making machine was shown by Kuestner, Dresden, Germany, and exhibited on the stand of Penicud & Co., Bagnolet, near Paris. This machine can be either hand-driven or motor-driven, and the sand is compressed into the core box by a screw. This machine can give cylindrical or polygonal cores.

Establissements Fenwick Freres showed a complete range of laboratory equipment for testing sands, including the Dietert permeability test, the Saejer test, and the Grubb moisture test.

Establissements E. Gernelle-Danloy, Reims, exhibited two examples of continuous sand mills with a delivery of 6 to 10 tons per hour and having a 4-horsepower motor. In these mills the rolls are of special design, which, it is stated, enables the sand to be mixed properly without the grain being actually crushed. Establissements A. Utard, Longeville-en-Barrois, displayed a sand mill with a rotating pan of their own type; also molding machines with reversible pattern-plate.

In the molding (*Please turn to page* 58)

Making Manganese Bronze

Experiments show value of using 10 per cent of aluminum bronze as a hardener for the alloy

By Charles Vickers

HARDENER used for years in manganese bronze was not considered satisfactory by the author, and an investigation was undertaken to determine the necessary changes. While the tests, which were described in the October issue of THE FOUNDRY, show that manganese bronze can be made by straight alloying of metals and without using a hardening alloy, more consistent results will be attained by using a hardener. Many tests were made, and many failures scored in the search for such a hardener.

After a time this work was laid aside and an investigation was undertaken to discover an exceedingly hard alloy of aluminum bronze. Such an alloy was needed to make ball bearings about 1-inch diameter for bearings under the heavy railroad guns to be sent to France. At that time the author completed developing titanium aluminum bronze and had made a series of experiments on the influence of iron on aluminum.

Hard Bronze for Dies

Research to discover a hard aluminum bronze resulted in the discovery of a bronze that was used extensively for the ball bearings and also for dies in which bedstead tubing was drawn. These dies were made for the Pittsburgh-Hickson Co., Pittsburgh, and that company discovered a method of heat-treatment which made the dies ideal for that purpose. The formula of Pittsburgh-Hickson, as it was named, was 70 per cent copper, 15 per cent aluminum, 12 per cent iron, 3 per cent manganese copper, the latter containing 30 per cent manganese. The most important factor in making the alloy was to get in sufficient iron. Whenever 12 per cent, or slightly more of iron was dissolved in the alloy, the fracture was not amorphous like a piece of glass, but slightly reddish and on the order of tool steel. With a lesser content the fracture was glasslike, and it was necessary to remelt the alloy and add more iron to correct brittleness.

Tinplate was the source of the iron, the thinner the tinplate the better. Thin Russia sheet iron also could be used, but tin plate was preferred as it was not so likely to be oxidized. Copper was first melted under charcoal and superheated. Fourteen pounds of iron was weighed and added to be certain that 12 pounds would be introduced into the alloy, since it is better to have a little over than a little under 12 pounds. Tin plate was curled loosely, tossed on the surface of the molten copper, and plunged quickly underneath the surface before it oxidized. When all iron had been added it was stirred in and a piece of aluminum added. Manganese copper was added at any stage of the making of the alloy, but usually with the cold metal. It could be reserved for cooling, if the alloy got too hot after the iron was dissolved, but this was not often the case, for the 15 per cent aluminum was added after the iron.

The usual procedure in making aluminum bronze was to melt copper and manganese-copper, superheating it under a thin layer of charcoal and then adding iron in the form of loosely coiled tin plate, which was immersed quickly in the molten copper and stirred. When the iron was dissolved, aluminum was added. The completed alloy was stirred and allowed to lie quietly for a few minutes before being ingoted. The

Manganese bronze is used extensively in the construction of propellers for power boats

formula was 70 pounds of copper, 3 pounds of manganese copper, 12 pounds of tin plate, (14 pounds added) and 15 pounds of aluminum.

This alloy was strong and hard. Its tensile strength was 110,000 pounds per square inch; its elongation, nothing; its brinell as cast 340 under 3000 kilogram weight; its brinell as forged 380 under the 3000 kilogram weight, and its fracture was like tool steel. While it had no elongation, it was difficult to break. It was a success as a hard alloy and had a moderate sale. The search for a hard aluminum bronze suitable for rustless ball bearings was finished.

The search, however, for a new hardener for making manganese bronze, was no nearer solution than when started. One day after much thought on the subject of such a hardener, the author decided to see what would happen if the hard aluminum bronze was used as a hardener in manganese bronze. The bronze contained aluminum, iron and manganese and so there was a possibility of using it in making manganese bronze. The formula used in the first test was similar to that with the steel alloy, namely, 57 pounds copper, 41 pounds zinc, 2 pounds of the hard aluminum bronze. No test bars were made, as nothing of importance was expected from the alloy. However, it looked good, and it was evident the hardener improved the alloy.

A number of trials followed with a charge of 52.50 per cent copper and 6.50 per cent Pittsburgh-Hickson alloy. These were melted together in a crucible and when thoroughly liquid, 41 per cent zinc was added. The zinc was broken into small pieces which were heated on the furnaces. The copper and the hardener first were stirred well and one small piece of zinc was added. This first piece always flared strongly. The balance of the zinc then was added and it did not flare so much. When the zinc was dissolved, the alloy was stirred thoroughly.

Avoiding Common Troubles

When poured directly into castings, the metal should be hot enough to have zinc begin to flare, but it must not be so hot that the zinc will crackle. When the zinc flared quietly the furnaces were checked. The bronze must be flared in the furnace from 10 to 15 minutes to get the desired elongation. That work must not be neglected, if the foundryman is to avoid erratic elongation and yellow spots in the fracture of the bronze. After 15 minutes flare, 1 pound of zinc per 100 pounds of bronze, or one per cent was added, the metal skimmed and poured.

Two test bars were made from the bronze and the following results were obtained: Bar 1, tensile strength 74,300 pounds per square inch; elongation, 27 per cent in 2 inches; reduction of area, 27.8 per cent. Bar 2, tensile strength 74,300 pounds per square inch; elongation, 25 per cent in 2 inches; reduction of area 23.6 per cent.

Test bars cast to size in sand molds from a heat made to pour a 3000-pound casting gave the following: Bar 1, tensile strength 71,600 pounds per square inch; elongation, 37.5 per cent in 2 inches; and reduction of area, 33.6 per cent. Bar 2, tensile strength 72,000 pounds per square inch; elongation, 44 per cent in 2 inches; reduction in area 36.6 per cent.

The chemical analysis was as follows: Copper 57.77 per cent; iron 1.09 per cent; manganese 0.08 per cent; aluminum 0.61 per cent; tin trace; lead 0.20 per cent; zinc 40.25 per cent. Ordinary Western spelter was used, and the lead no doubt came from that source. This conformed to most specifications in all particulars except it might be low in manganese for some purchasers. In that case a little extra manganese could be added easily, either in the form of metallic manganese or as manganese-copper. One such change was made when the charge was melted as follows: Copper, 50.75 per cent; 30 per cent manganese-copper, 1.75 per cent; hardener 6.50 per cent. These were melted together and 41 pounds of zinc added. The little addition of manganese satisfied the customer and made no particular difference in the physical properties of the alloy.

Procedure Followed in Melting

Manganese-copper, copper and hardener all were added together. If some of the charge had to be left out at the start, the copper would be omitted and added as the metals melted down in the accustomed manner. In one instance, over 300 pounds of the metal of the formula mentioned was melted in crucibles. Just as it reached the flaring point, an accident occurred to the mold which caused a delay of 1 hour. The metal had to be held in the furnace, but no additional zinc was added.

The author felt the bronze was ruined, for although the covers of the coke fired furnaces were rolled off and charcoal was used liberally, as is usual in such cases, the metal flared rather strongly for 1 hour. However, the casting was poured and successfully passed specifications, which fortunately were not high. The physical properties were as follows: Bar 1, tensile strength 62,300 pounds per square inch; elongation, 46 per cent in 2 inches; reduction of area, 38.8 per cent. Bar 2, tensile strength, 62,600 pounds per square inch; elongation 49.5 per cent in 2 inches; reduction of area, 49.7 per cent.

Further experience with the aluminum-bronze hardener resulted in the use of 10 per cent in place of 6½ per cent, which gave more reliable results. Thus the charge became, in several instances: Rolled scrap copper, 49 per cent; aluminum bronze hardener, 10 per cent; zinc, 41 per cent. This mixture was melted and the bronze poured as soon as the zinc was added and the alloy was hot enough for pouring. Two test bars were made, cast to size in sand molds with the following (*Please turn to page* 50)

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the following advisory staff: Steel, John Howe Hall; Malleable, H. A. Schwartz; Gray Iron, John W. Bolton; Nonferrous, Charles Vickers.

Dry Cores for Large Steel Annealing Box Castings

Several years ago I saw a reference in THE FOUNDRY to the method for making large annealing box castings. The grooves on the core face were formed by attaching dry sand cores after the pattern was removed, but the description did not state whether the core was dried. The contraction problem is severe and I wonder if it was solved by pouring the steel into a dried mold around a green sand core.

In the instance to which you refer—THE FOUNDRY, Dec. 15, 1927—the mold and core were dried thoroughly in the usual manner. Furthermore, this represents the usual practice in nearly all foundries where large annealing boxes are made. Foundrymen with the experimental urge occasionally have made some of these castings in molds in which the outer part was dried but in which the core was not dried. For various reasons the method never has been adopted to any extent. One reason is that a mold of that kind be entrusted to only a highly skilled molder, while a mold in which mold and core are dried, is within the capability of men with little skill or training.

Drying the mold and the core removes all hazard of wet sand, a prolific cause of scabs, cuts, blows, all manner of surface and interior imperfections. A dry sand mold and core resist the pressure of the metal to a greater degree than a contemporary mold and core formed in green sand. A dry sand face resists erosion better than green sand. Even with a dry sand core and a heavy coating of silica wash, the inside of one of these castings involves a considerable amount of cleaning labor. A green sand core would increase this cost to a prohibitive extent. The inside of the dry sand core is filled with loose coke or cinders to permit compression of the core while the metal is contracting.

Manganese Bronze Lacks Fluidity Desired for Casting

On several occasions the writer has been asked why some manganese bronze castings flow properly and others do not. Can you give me any information on that subject?

Manganese bronze is an extremely fluid alloy, and runs freely in sand molds, provided it contains aluminum. However, not all manganese bronze contains aluminum, and if you happen to be casting some alloy that does not contain aluminum, it may not run into sand molds. Such manganese bronze is not for casting purposes and it is known as forging manganese bronze. All that is required to convert it into casting aluminum bronze is to add aluminum. If you happen to use an alloy of that sort and find it will not run into molds, simply add 0.5 per cent aluminum when the difficulty will be remedied. Of course, there also is such a thing as pouring it too cool, but it is much more likely that the absence of aluminum is the source of your trouble.

Dirt and Slag Lodge Against Cope Face of Casting

We are sending a small flange shaped casting 5½ inches in diameter, ¾-inch thick with a small hub 1½ inches deep and 2 inches in diameter on one side. The hub side is machined all over. Out of 50 castings, 14 developed the defect shown in the sample; a blowhole or shrinkhole at one point in the junction of the hub with the face of the casting. You will note the manner in which this casting is gated. It was poured from a mixture of 2X pig, 50 per cent and first grade machinery scrap, 50 per cent.

Presumably the casting was poured through a small gate in the rim, and, this small gate was connected to a channel or runner designed to feed three other castings. The surface on the

cope side shows that considerable sand was floating on the iron. The characteristic appearance of the defective area, the blowhole, shows that slag was lodged at that point. From the foregoing it is apparent that at some point between pouring cup and gate entrance, a certain amount of sand was washed loose. Also that some slag escaped the skimmer on the ladle.

Some of this slushy material floated in with the first dash of iron. Some of it continued to float and eventually was pressed up against the cope face. A small quantity came into contact with the shoulder of sand at the junction of the hub and flange. It remained there to form the cavity only disclosed after the casting was partly machined.

See that gates and runners are kept scrupulously clean, and adopt some form of gate that will intercept foreign material before it enters the mold. Naturally the size and style of gate will depend on the number of patterns in a flask. Practically every form or skimming device in connection with gating castings has been described in a series of articles on this subject which began in the Jan. 1 issue of THE FOUNDRY and has continued up to the present.

Base Volume of Blast on Quantity of Coke Consumed

Can you tell us the proper blast volumes for a 34-inch and a 42-inch cupola? We are making high grade machinery castings, and melting our iron extremely hot.

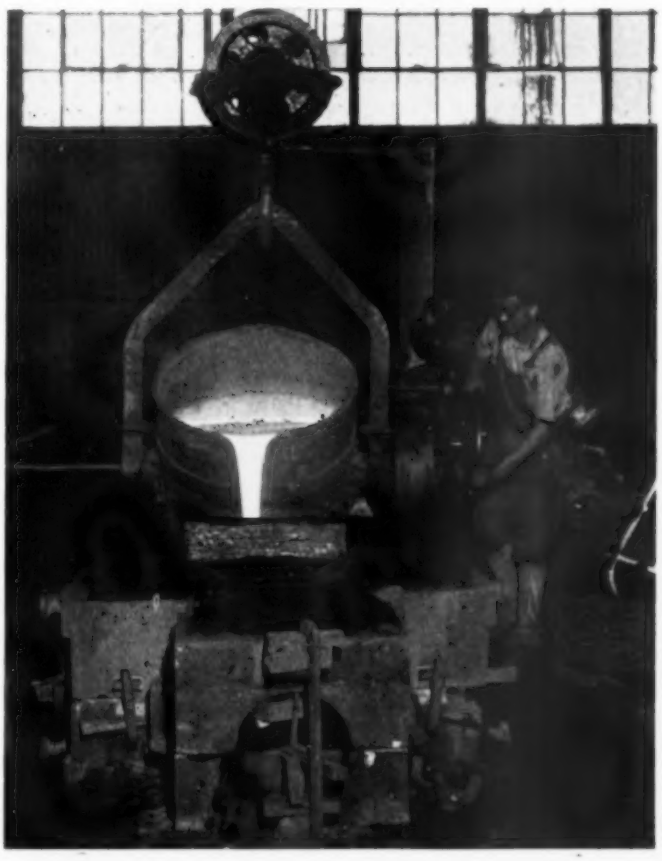
Since you do not state the quantity of metal melted per hour in the cupolas, or the quantity of coke placed between charges, it will be mainly guesswork to suggest the blast volumes for the cupolas you mention. Incidentally, calculation will only give an approximate value or base which may have to be varied more or less depending upon the operating characteristics of your particular cupolas and the coke used. The base figure is easily obtained by multiplying the tons of iron melted per hour by the amount of coke placed between the charges which gives the amount of coke burned per hour. Divide that value by 60 to obtain the amount of coke burned per minute. The quotient obtained multiplied by 132 gives the amount of air required per minute in cubic feet as it is claimed that 1 pound of coke requires 132 cubic feet of air at 60 degrees Fahr. and 14.7 pounds per square inch barometric pressure for complete combustion.

For example, if your 42-inch cupola is melting 6 tons per hour and the coke splits weigh 250 pounds per ton, the cupola is consuming 1500 pounds of coke per hour or 25 pounds per minute. Twenty-five times 132 cubic feet gives 3300 cubic feet of air per minute required for combustion. However, you may find by experiment that better results are obtained by using 3000 cubic feet, or perhaps with 3500 cubic feet. Hence, the thing to do is to determine the theoretical amount of air by calculation, and operate the cupola with that amount for a few days making careful observations on melting rate and metal temperature. Then increase the amount of air for a few days and note the results. Likewise try reducing the amount of air. Then compare operations under the various conditions, and select the volume that gives the best results.

Must Consider Furnace Design with Changing Fuel

We have been melting brass with a pit fire, using a coal bottom, and coke sides, and a forced draft. We have since changed to coke entirely to eliminate gases from the coal in the foundry. We were wondering if it would be possible to use the present equipment and insert beneath the fires a burner of some kind to melt by oil.

Oil burners can be substituted for coke firing, and there are several burners on the market suitable for such service. However, while such change from solid fuel to oil can be made, it is not satisfactory to change only the fuel. Coke furnaces are not of the correct shape, for gas or oil melting, and it is questionable if just a change in fuel will prove satisfactory. It would be more economical to purchase an oil melting furnace, rather than try to rig one up out a coke hole. The oil furnace has a different cover to the coke furnace, and it carries an attachment for handling the cover which is quite heavy and difficult to handle minus the arrangement for handling it. A good oil furnace for



crucibles ought to melt a No. 70 pot of red brass in 1 hour, starting cold, and in 35 minutes starting hot.

Has Trouble with Highly Leaded Bearing

We are making an alloy used for bearings in locomotives and railway cars, which contains 57.5 per cent lead, 42.25 per cent copper, and 0.25 per cent nickel. We are having some difficulty with the alloy and will appreciate any information which will aid us in producing it.

Production of copper base alloys high in lead is easy for some foundrymen and difficult for others. Perhaps the best suggestion is to refer you to the article entitled "Mixing Copper with Lead," by Charles Vickers which appears on page 24 of the September, 1932 issue of THE FOUNDRY. In that article mention is made of the various methods employed in holding in the lead. One of the fluxes that the author recommends for preventing segregation of lead consists of 25 per cent sodium sulphate, 45 per cent calcium sulphate or plaster of paris, and 20 per cent sodium chloride or salt.

Flux to the amount of 2 per cent of the metal weight is added; 1 per cent being added with the cold metal in the pot, and 1 per cent after the metal is molten. Another flux recommended is barium sulphate, the amount used being the same as previously mentioned. A third flux is composed of calcium carbide and calcined borax. The quantity of each used is 1 per cent of the metal charged. The material is placed in the bottom of the crucible and the copper is melted on top.

Pouring temperature also is important in producing these high lead alloys. Cold metal promotes segregation of the lead, and it is advisable not to pour the alloy below 1800 degrees Fahr.

Steel Straps Hold Chaplets on Lamp Posts

In an interesting article on the manufacture of cast iron lamp post which appeared in THE FOUNDRY about a year ago we do not recollect that mention was made of the method employed to anchor the cope chaplets. Can you supply us with information on that point.

As you probably are aware, many methods are available for securing cope chaplets. The method adopted in any particular instance usually is dictated by local conditions. In the shop to which you refer, the molds are made in heavy iron flasks, without bars in either cope or drag. The joints are planed and a wide sand strip approaching to within 1½ inches of the pattern holds the sand in place on the joint side of each half mold. A substantial wood bottom board supports the sand at the back when the drag is rolled over. A heavy iron plate clamped on the cope before it is lifted from the ramming table, performs the same service for the cope. Manifestly it is impossible to bed this plate down with the degree of accuracy required to engage the ends of chaplet stems, cut to a uniform length. To attempt to cut and fit each chaplet individually would mean a great deal of wasted time. The daily output is 100 castings and each casting takes four chaplets in the cope.

The ingenious method was adopted to hold the chaplets in place in the cope. Four rectangular openings, 6 x 8 inches and spaced about 2 feet apart on the center line of the plate, provide a wide range of positions for the chaplets on various lengths of castings. A piece of steel band ¼ x 2 inches and bent to a right angle at each end, is anchored firmly by the toes over each opening in the plate. They were anchored by this simple expedient of setting them up in the mold for the covering plate and then pouring the iron around them. In shop pariance the straps or bands *were cast in*. Chaplet stems cut to a uniform length project through these openings in the plate and approach to within ¼, ⅜ or ½-inch distance of the steel band. A molder slips a pair of thin wood wedges, from opposite sides, between the top of the chaplet stem and the bottom side of the steel strap, and the chaplet is held accurately and safely in place.

Cast Iron Boring Melting Data Is Given

A considerable drop in the market price of cast iron borings in this district prompted us to attempt using that form of scrap which we produce to quite an extent in our machine shop. Our first attempt was a disappointment and we shall appreciate any advice you can give us on how to utilize that material in the production of gray iron castings. We pressed the borings into cylindrical blocks 6 x 8 inches. These were charged in a 56-inch cupola in the usual manner with the exception that silica sand instead of limestone was used as a flux. Out of a total charge of 7100 pounds of borings we recovered 6375 pounds of castings, gates and scrap. The castings were brittle white iron with many worm holes.

The practice of using borings for making up part of the charge in a cupola is so widely observed that it no longer excites the comment of earlier years. The practice has formed the subject of many discussions, before foundrymen's associations and in THE FOUNDRY. So far as we can remember none of these references ever admitted that the product was white iron or that the iron was full of worm holes. However, in all fairness it must be admitted that none of these discussions, papers or addresses claimed that the entire charge of the cupola was made up of borings. Experimenters, without exception, have found that the silicon loss where briquets are employed is much greater than where the charge is made up of the ordinary pig iron and scrap.

In an extensive series of experiments referred to by Hurst in *Melting Iron in the Cupola*, the silicon content dropped from 2.25 to 1.30 per cent in iron taken from charges in which the briquets were increased from 20 to 80 per cent. In all these instances the briqueted borings were mixed with a wet binder and were rusted extensively. Silicon loss was brought about by the presence of this rust. The same effect may be noted when melting rusty scrap. Allowance must be made for this silicon loss and the correct amount of ferrosilicon added to the charge to compensate for the loss.

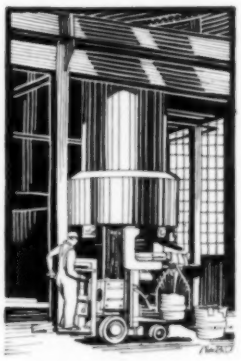
No Change Necessary

In the American Foundrymen's association exchange paper presented before the Institute of British Foundrymen, June 17-20, 1930, the author Fred J. Walls, presents a comprehensive description of the use of cast iron borings pressed into exceedingly hard briquets. He claims that no change of any kind is necessary in practice and no change of any kind is noticeable in the iron from charges containing up to 20 per cent briquets. Over 20 per cent, the loss of silicon increases up to a point where a drop from 2.30 to 1.63 per cent was found in an experimental heat run from an all briquet charge in a 24-inch cupola. The heat was made up of four 600-pound charges with 90 pounds of coke, 30 pounds of limestone and 4 pounds of fluorspar between charges. The iron came out hot and a recovery of 2208 pounds was obtained, showing a melting loss of 8 per cent.

Analysis and physical properties of that metal showed a loss in silicon from 2.30 to 1.63 per cent, a gain in sulphur from 0.08 to 0.14 per cent, a loss in manganese from 0.75 to 0.58 per cent, a loss in total carbon from 3.35 to 3.17 per cent, no change in the phosphorus, brinell on 1-inch square bar 260, transverse on 1-inch square bar 3400 pounds, deflection on 1-inch square bar 0.13-inch, tensile strength 35,660 pounds per square inch. If you must use briquets exclusively you will have to add ferrosilicon to the charge, perhaps a little ferromanganese, plenty of coke and limestone, and use a mild blast.

Viewing Foundry Developments

At Short Range



FOLLOWING an extended series of experiments, a Midwest steel foundryman has developed a system for producing steel castings without the use of feeders or sand. The castings are produced under pressure in metal molds. In addition to the saving effected in the amount of metal required to be melted for a given tonnage, the castings are claimed to present a surface appearance superior to those produced in sand and to possess a tensile strength of over 100,000 pounds per square inch. The process is based on a definite relationship between the temperature of the metal and the thickness of metal section in the casting. Through the radical reduction in production cost the manufacturer anticipates a wide and highly profitable market.

• • •

A prominent stove maker increased the heating efficiency of the burners in its gas ranges 15 per cent by applying cone reflectors made of enameled cast iron.

• • •

A MANUFACTURER of cast aluminum cooking utensils is marketing a group of products having the cooking surface processed to eliminate inside stain. Each piece possesses a rich silvery inside finish that is claimed definitely resists all mineral salts or fruit and vegetable acids. Provided directions are followed, the utensil is guaranteed against discoloration and corrosion of the cooking surface.

• • •

Recent investigations indicate that additions of nickel to bronze causes the atoms to combine in a radically different manner than in ordinary bronze, with the result that the strength is increased. By controlling the size of these atomic groups through heat treatment, it is said to be possible to harden nickel bronzes in a manner analogous to duralumin, thus providing an engineering material of broad application to such parts as gears, bearings, valves, propellers and other products.

• • •

Small additions of molybdenum in 0.40 to 0.50 per cent carbon steel are recommended to prevent creep at high temperatures. Castings of this character are used in valves for superheat steam lines, refinery and chemical plant service and in tongs, hooks and small parts for handling hot materials.

• • •

Chromium plated cast iron kitchen utensils recently have been introduced by a large manufacturer. It is pointed out that the chromium finish makes the product ready for instant use, eliminates the necessity for seasoning, prevents discoloration and makes the utensil easy to clean.

• • •

CARE is necessary in choosing the material to form joints when high nickel and chromium, cast steel fittings are used with pipe lines of the 18 and 8 range of rolled steel products according to an engineer identified with the sulphite paper industry. Reaction between the components inducing corrosion is encountered when monel metal is used. Rubber is ineffective. Joints of bronze alloys or lead have the preference, it is said.

• • •

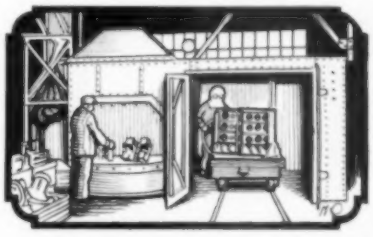
A jolt counting device has been developed to provide a more uniform control in the manufacture of molds. Few moving parts are used and the number of jolts is controlled automatically by setting a valve on the counting device.

• • •

An investigation carried on in the metallurgical department of the National Physical Laboratory, Teddington, England, shows that dissolved gases readily are removed from molten aluminum by passing through the metal a mixture of cylinder nitrogen and the chlorides of titanium or carbon. It is not necessary to purify the nitrogen. The quantity of chloride required is quite small, 0.25 cubic centimeters per pound of metal has proved satisfactory even for small melts. Sand and chill cast aluminum alloys, one containing 12 per cent zinc and 3 per cent copper and the other containing 4 per cent copper, 1½ per cent magnesium and 2 per cent nickel, treated by that process, possessed excellent mechanical properties.

• • •

METHODS have been worked out for the rapid production of an artificial patina on copper, with consequent elimination of the long period normally required for development of the natural product. Certain synthetic coatings other than basic copper sulphate, although initially green, readily blacken on exposure to town air. Application of linseed oil and more especially of lanoline to the primary coating gives marked protection to the underlying metal, but does not prevent discoloration. Application of water glass and silicon ester, on the other hand, appreciably increases corrosion. A green patina of basic copper sulphate may



be obtained by treating the metal with a solution of ammonium sulphate, preferably followed by application of a mixture in which basic copper sulphate is suspended. The coating breaks down under severe weather conditions, probably through physical causes. A patina that is stable under similar conditions is produced by an anodic treatment of 15 minutes duration in a suitable electrolyte. It has a good green color and is quite insoluble in water.

The FOUNDRY Family Photograph Album

Upper Left
ALBERT E. GROVER
Gray Iron Institute
Cleveland

Upper Right
JOHN MILLER
Connersville Blower Co.
Connersville, Ind.

Lower Left
FRANK O. CLEMENTS
General Motors Corp.
Detroit

Lower Right
GEORGE C. KLINE
Honolulu Iron Wks.
Honolulu

Men of Industry

Whose Activities Are Making Foundry History

COL. GEORGE M. MORROW JR., for the past several years vice president of the Goslin-Birmingham Mfg. Co. Inc., Birmingham, Ala., has been elected president, to succeed the late Julius Goslin. The new president is a graduate of West Point and served as a lieutenant-colonel during the World war. The Goslin-Birmingham company is a consolidation of the former Birmingham Foundry & Machine Co., of which Colonel Morrow was president, and the Joubert & Goslin Foundry Co.

HYMAN BORNSTEIN, director of laboratories, Deere & Co., Moline, Ill., spoke on "Fundamentals of Steels and Their Treatment" at a meeting of the Tri-city chapter of the American Society for Steel Treating at Davenport, Iowa, Oct. 11.

GEORGE B. INGERSOLL, associated for 31 years with the main works of Fairbanks, Morse & Co. at Beloit, Wis., the last 15 years as assistant general manager, retired Oct. 1 at 65, under the company's pension system. He joined the Beloit staff April 29, 1910, and was elected secretary in 1907, being advanced to assistant general manager in 1917.

JOHN H. BIRDSONG, until recently in charge of metallurgical operations, Pratt & Letchworth Co., Buffalo, and prior to that chief chemist and metallurgist, Chicago works, National Malleable & Steel Castings Co., has been elected a director of Williams Laboratory Inc., 11-15 East Swan street, Buffalo. He will hold the position of metallurgist.

J. S. TRITLE, vice president and general manager, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., was elected president of the National Electrical Manufacturers' association to succeed John H. Trumbull, at the recent annual meeting of that organization.

DR. WILLIAM D. COOLIDGE has been appointed director of the research laboratory of the General Electric Co., Schenectady, N. Y., succeeding DR. WILLIAM R. WHITNEY, who has retired because of poor health. Dr. Coolidge became connected with the laboratory in 1906, was appointed assistant director in 1908 and associate director in 1928.

SAMUEL R. ROBINSON has been made sales manager for the Saginaw, Foundries Co., Sagniaw, Mich., manufacturer of electric steel and gray iron castings. Mr. Robinson previously was connected with Babcock & Wilcox Co., Barberton, O. He was educated at Virginia Polytechnic institute and following his graduation secured a position with the Duquesne Steel Foundry Co., Corapolis, Pa., as metallurgist, a position he held for 11 years. From 1918 to 1920 he was metallurgist for the Philadelphia Roll & Machine Co., Philadelphia and was engaged in the production of alloy iron and chilled iron rolls. He then became foundry superintendent for the Paper & Textile Machine Co., Sandusky, O., remaining with that company until 1922. From 1922 to 1931 Mr. Robinson was foundry manager and metallurgist for the Industrial Brownhoist Corp., Bay City, Mich.

Samuel R. Robinson

H. A. LOMAX, formerly with the Continental Roll & Steel Foundry Co. at Pittsburgh, has been appointed manager of the roll department of the Pittsburgh Steel Foundry Corp., Glassport, Pa.

National Founders To Meet in New York

The annual meeting of the national Founders' association will be held at the Waldorf-Astoria, New York, Wednesday and Thursday, Nov. 16 and 17. A program dealing with industrial education and unemployment problems has been prepared, according to the announcement of J. M. Taylor, secretary.

Booklet Describes Iowa Personnel Service

Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa, has published a booklet entitled "Personnel Service for Iowa State Engineers" which explains the functions of the engineering personnel office and describes the educational training given to engineers at that institution. The personnel office is organized to establish contacts between employers of technically trained men and alumni, graduates and under graduates of the college. Frank D. Paine is engineering personnel officer in charge of the new activities.

Talks on Molybdenum

"The Use of Molybdenum in Cast Iron" was the subject of a paper by J. Kent Smith and Carl M. Loeb, Jr., Climax Molybdenum Co., Detroit, presented at the regular monthly meeting of the Philadelphia Foundrymen's association, on Oct. 12 at the Manufacturers' and Bankers club, Philadelphia. J. B. Greenstreet, Olney Foundry Co., Philadelphia and president of the association, presided.

Reader's Comment

Interesting communications from readers of The Foundry

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or of Its Editors.*

Overseas Amenities

TO THE EDITORS:

Heartiest congratulations to THE FOUNDRY on attaining its 40th birthday from her baby sister *The Foundry Trade Journal*, who has now entered her 30th year. The cordial relationship, which has always existed between these service-giving business newspapers, constitutes the very basis of international good fellowship. The American and in fact the world's foundry industry owes much to the guidance it has received from the editorial chair of THE FOUNDRY. May its future prosperity be commensurate with its high intrinsic worth.

V. C. FAULKNER

Editor
Foundry Trade Journal
London, England.

Gone Farther

TO THE EDITORS:

Many of your good friends have probably neglected to congratulate THE FOUNDRY on the successful completion of forty years' service to the industry, because mere existence for forty years isn't much of a trick (as one can see by merely looking about him).

I do wish, however, to congratulate you upon the October issue, not only in typographic form and pictorial quality but also as to editorial content. It is my impression that you have gone farther in the first two items mentioned in the last forty months than in the previous forty years.

E. E. THUM

Editor, Metal Progress
Cleveland

Owes Much

TO MR PENTON:

It gives me great pleasure to congratulate you and THE FOUNDRY on 40 years as leaders in the foundry industry.

We already had been in connection with the business four years when I first met you in Detroit.

I think that the American Foundrymen's association owes more to you than any other one active promoter, in its being able to weather the various troubles that naturaly come along in the life of such an organization.

It has been a pride, joy, and a privilege to have had the contact with you over so many years, and I hope that you will be spared to continue in your helpful way.

E. M. AYERS

President
Ayres Mineral Co.,
Zanesville, O.

Misses Data Sheets

TO THE EDITORS:

I have been following the foundry in its new form and can say with many others that the monthly issues in the present form are a considerable improvement over the bimonthly issues. The reading is in exceptionally good form. The only thing I miss is the data sheets that were published for so many years. I always enjoy "Bills" philosophical discourses and consider them a most valuable part of the publication.

O. W. POTTER.

University of Minnesota

Never Deviated

To Mr. Penton:

In announcing that THE FOUNDRY was entering on its fortieth year the statement was made that "The foundry industry of today owes full measure of recognition to the conscientious, hard work of the men, who built and perpetuated this publication."

As one who fully realizes this debt, I have great pleasure in bearing my personal testimony to the service rendered to our industry by THE FOUNDRY, and to congratulate you on the consistent manner in which all your pledges have been fulfilled.

My close acquaintance with the publication both as a reader and a contributor, while it does not go back to the first issue covers over 30 years, dating back to 1901 when I first came from England as the representative of Alexander Tropenas to install side blow converters for the manufacture of steel castings. I have read THE FOUNDRY consistently ever since and in those early days was a more or less regular contributor to its columns, particularly in connection with steel foundry matters, which were then in a rather primitive state of development. During all these years THE FOUNDRY has never deviated from its original purposes and ideals and is today at 40 years as vigorous, progressive and useful a publication as it ever was.

The traditions of the industry are in good hands today, the work is being ably carried on by the new generation and the future undoubtedly holds developments greater than any we have seen or contemplated. In this progress I am sure THE FOUNDRY will bear an honorable part.

ARTHUR SIMONSON

Vice-President
Falk Corp.
Milwaukee.

Excellent Articles

TO THE EDITORS:

In addition, I read the "Adventures of Bill" and particularly that part describing a cracked diesel piston. I also thought the article on page 23 on the Stearn's diesel was especially fine and desire to commend you for the excellence of the articles included in that issue.

R. L. SACKETT

Dean of Engineering
Pennsylvania State College
State College, Pa.

Efficiency Tickled

TO THE EDITORS:

Congratulations on the 40th anniversary of THE FOUNDRY and double congratulations to its founder, my old friend John A. Penton.

The first copy fell into my hands through a kindly foreman when I was but a stribling apprentice, and to the best of my belief I have never missed a copy since. It was always an inspiration and a wonderful efficiency tickler, but never any more than now.

JAS. A. MURPHY

Jas. A. Murphy & Co.
Hamilton, O.

A Hint to Molders

To the Editors:

My connection with the foundry industry covers a period of 48 years as a molder, foreman and manager. In that lengthy period I necessarily acquired much information regarding the attitude and personal qualities of both employer and molder. I would like to impress on all molders that most of your opinions of your employer are absolutely wrong; in most cases he is looking after your welfare far more than you do yourself. He is confronted daily with the burden of seeking work to keep you employed, especially at the present time. His work does not end when the whistle blows.

After the molder has finished his day's work, poured off and shaken out his flasks, his work is completed

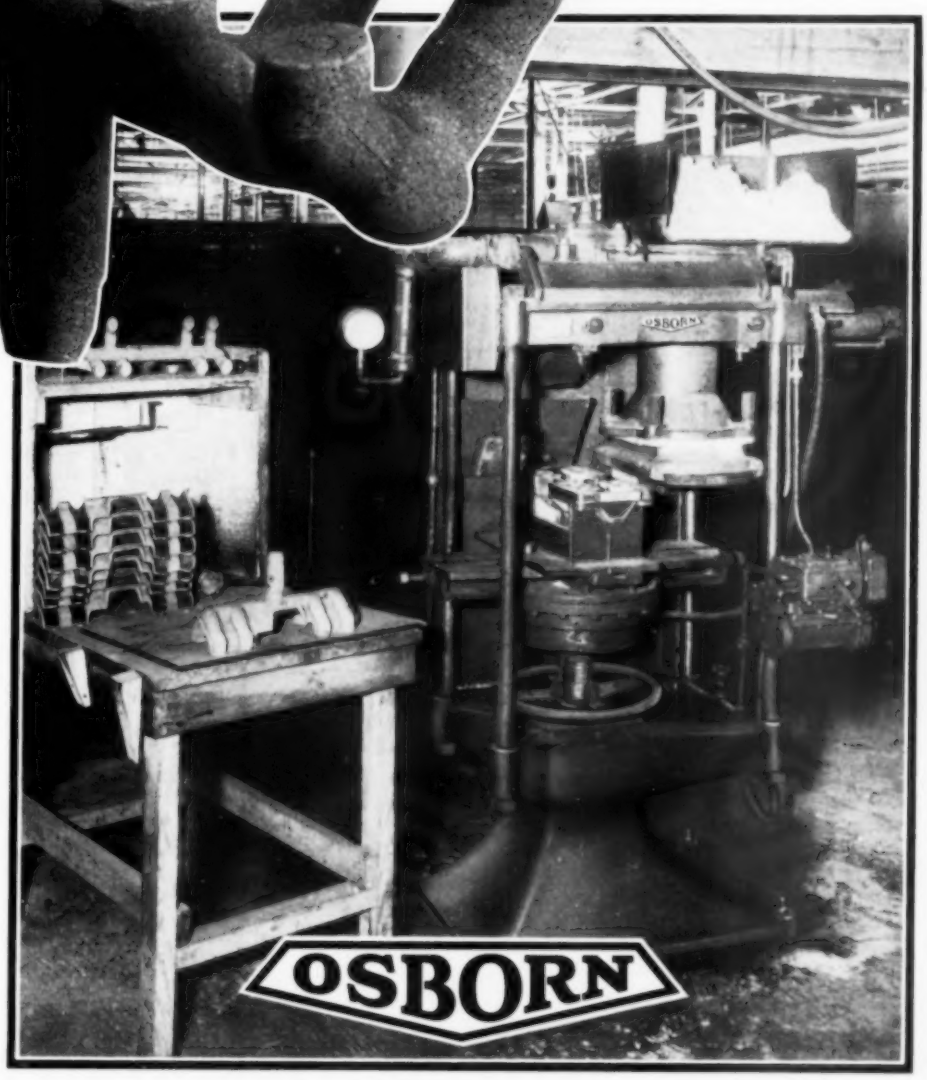
(*Concluded on Page* 38)

More than 100 of these cores per hour!

and each core uniformly blown throughout by the New Osborn No. 91 Core Blowing Machine at the National Bronze and Aluminum Foundry Company of Cleveland, Ohio.

Core for intake manifold of a V-8 automobile engine.

The New Osborn No. 91 Core Blowing Machine in action at the National Bronze and Aluminum Foundry Company of Cleveland, Ohio.



WHY is this New Osborn No. 91 Core Blowing Machine in action at the National Bronze and Aluminum Foundry Company?

It delivers *uniformly* high quality cores at *uniformly* high production and at *uniformly* low cost!

ONE VALVE automatically controls all operations of this machine. One man operating the machine and one man drawing the core comprise the "crew". Cores are made without the use of wires.

These and other advantages of the Osborn No. 91 combine to make a new standard in Core Blowing Machine efficiency.

THE OSBORN MANUFACTURING COMPANY
5101 Hamilton Ave.,—Cleveland, Ohio, U.S.A.
Agencies all over the World.

(*Concluded from page* 36)
and he has little to worry him until the next day. He does not have to worry about being paid for his services but is sure of his wages on pay day. In my experience I never have known a molder not being paid to the last cent for the work he performed. This is not true of the employer. Many times he is unable to collect pay for castings delivered and often has to allow 1 to 10 per cent reduction in price for quick payment. Have you ever heard of a molder having to deduct a certain percentage from his pay to get his wages when due? The employer never is positive just when he will receive the money due him; sometimes never and often after a long tiresome wait. Nevertheless he has to secure pay for the employe and also pay his bills for material. It is not difficult to see the vast difference in the employer and employe positions as far as remuneration for services rendered is concerned.

I want to say a few honest words regarding that disagreeable time in slack seasons when the employer is placed in a difficult position and has to lay off a certain number of men. I really think he dislikes it more than the employe, especially when he has to choose between laying off a first-class mechanic who has many bad traits and another molder, who is only a fair mechanic but a hard-working, honest, cheerful and pleasant shopmate. I recall an example of the former type that once worked for me. He was far above the average in mechanical ability and needed little attention by the foreman, but his good qualities ended abruptly there. He was wrangling continually with his fellow workmen and never had a gracious or kind word for his helper, or for anyone else. At noon when the men were congregated he would abuse his employer, his country, his church and even his family.

On the other hand, I remember many molders who always were cheerful, spoke well and acted well toward all of their shopmates and were willing to help any man who was a little behind in his day's work. They had all of the attributes of good, honest employes, kind fellow workers, men you were glad to meet and associate with, but they were only fair mechanics. However in case of a lay off it is not hard to decide which man will be retained. You can try to improve the fair mechanic; the foreman can give him more attention and guide him so that his work will improve. But the other man never can be changed; the poison is too deeply rooted.

On large loam work it often happens that the man sweeping up the mold cannot get on the first coat of loam before quitting time, and thus loses the overnight drying. Several hours are lost the next day waiting for the loam to set, since the second coat or slurry cannot be put on when the first coat is green. If the molder will approach his foreman and ask permission to stay an hour or two until the loam is on, several hours will be gained the next day and the foreman will appreciate the forethought, especially if no over-time is considered. The molder would make a lasting impression as an honest, sincere workman trying to help his employer, and we all know the employer needs help in these depressed times. The same would apply to large sand work, since a mold not dressed up completely at night dries out, causing more work the next day.

Think this over, use my advice and you will gain in the end. I am convinced that if a crew of molders in any shop would band together and try in every way to make production more economical by intelligent use of materials, equipment, patterns, flasks and many other articles, both employe and employer would benefit. Attention to such small details as wetting wooden flasks to keep them from burning after being poured, watching the amount of gas and electric current used, limiting the amount of facing sand to that actually required, using mud in place of loam in making a considerable part of a loam mold, returning chaplets to the store when not used, and taking care of the various tools will result in many economies.

With all of its heat, dirt and smoky atmosphere, I really think that the foundry offers one of the most healthful trades of today. Of course, it is necessary to be strong and healthy to start, but I have noticed and wondered at the little time that is lost by molders through sickness. I have had several men over 70 years of age working on the largest of castings, doing a good day's work and never complaining about being tired.

No one comprehends more than I that the molder's trade in all its various branches is a hot, hard and wearisome occupation, both mentally and physically, but other trades are far more so. In normal times I think it one of the best paid and most interesting. It is a joy to look at a large complicated casting after it is cleaned and to know that you created it. What a thrill of pride shoots through you; you would like to show it to your family and friends and say with pride, I made that. But do not forget that one man, your employer, has supplied many things that enabled you to produce this fine casting. You have invested only the time consumed in producing such a casting. He has invested in buildings, cranes, cupolas, flasks and many other pieces of equipment and supplies. So let us take our hats off to the patient and hard working employer who takes all of the risks and all of the losses. Let all of us molders, by hard, honest and intelligent work, try to make those losses less in these difficult times.

G. C. M.

Quad City Group Hears Discussion on Coke

O. L. Pringle, vice president-general manager, St. Louis Gas & Coke Corp., Granite City, Ill., spoke at the regular meeting of the Quad-City Foundrymen's association held Oct. 17 at the Davenport chamber of commerce, Davenport, Iowa. Mr. Pringle talked on "Foundry Coke, Its Manufacturing Specifications, etc." and presented a brief description of the method of making by-product coke. He also described the use of the coke in the cupola and blast furnace. A lively discussion followed the talk.

Charles F. Sherer, Davenport Machine & Foundry Co., Davenport, Iowa, and president of the association, presided. He announced the appointment of Alex Matheson, French & Hecht Co. Inc., Davenport, as chairman of the membership committee. Sixty foundrymen were present including visitors from Kewanee, Ill., Peoria, Ill., Clinton, Iowa and Freeport, Ill.

A. S. M. E. Program Includes Foundry Topics

Annual meeting of the American Society of Mechanical Engineers will be held in New York Dec. 5 to 9. The following papers, to be presented at the meeting, are of interest to foundrymen: "Special Steel for Castings," by R. A. Bull; "Malleable Iron as a Component Part of Machines and Structures," by Enrique Touceda; "Progress of Machine Shop Practice Division"; "Materials Handling as a Factor in the Transportation of Commodities," by M. W. Potts and J. A. Cronin; "The Engineer's Interest in Foreman Training," by Edward S. Cowdrick; "Fundamentals of Training," by G. Guy Via.

Bulletin Shows Machinery Distribution

How the consumer's dollar spent for industrial machinery is split between the distributor and the manufacturer in the hardware trade of the Gulf Southwest is one of the interesting sidelights upon that important market for industrial goods which is brought out in the newest regional commercial survey of the U. S. department of commerce, entitled "Hardware Distribution in the Gulf Southwest." The bulletin may be obtained from the superintendent of documents, government printing office, Washington, 40 cents.

Prevent Losses with

Proper Gates and Risers

By PAT DWYER

A HIGH head and hot metal constitute the two main essentials in the method of pressure casting described in the preceding article of the present series (THE FOUNDRY, Oct., 1932). Where these features are ignored or overlooked, no advantage is gained from pouring the castings in a vertical position. On the contrary the castings poured in a vertical position will not be as satisfactory as the same castings poured horizontally and equipped with adequate risers. A typical example is shown in Figs. 182 and 183.

A mold for a bronze pump body arranged for vertical pouring is shown in Fig. 182. Castings poured in this position and gated as shown will show a high percentage of leakers. The apparent advantage of the method is that the molds may be made more rapidly than where the mold is designed to be poured in a horizontal position. Pattern for the pump body, sprue, gate and riser—split of course—is mounted on both sides of a pattern plate. After the cope is lifted off, all the molder has to do is remove the pattern and close the mold, clamp it and stand it on end on the floor.

Two bottom boards are required, one on the cope and one on the drag. The molder rests his pot against the top edge of the board nearest the gangway and with that as a fulcrum he tilts the pot so that the stream enters a hole provided for that purpose in the joint line of the flask. The board usually is protected from burning at the top by a loose piece of angle iron.

In the method illustrated in Fig. 182 the pump body was cast solid, that is without cores, and the vertical runner was of small diameter. It merely served to fill the mold and neither fed nor bled the casting. As the metal ascended in the mold, the temperature dropped with the result that cold, almost congealed metal filled the shrink ball at the top. This feature was accentuated in the last molds poured from the pot where the temperature of the metal dropped steadily between the first and last mold in any given group.

The small riser shown in Fig. 182 was totally inadequate for its intended purpose. Even under more favorable temperature conditions the constricted neck would freeze first and prevent the passage of any metal from the riser to the casting. As a result of this arrangement the lower and hotter part of the casting levied on the upper part for feeding metal to compensate for natural shrinkage.

The casting apparently was perfect as it came from the sand. The outside was clean and solid even at the point where the riser was cut off, but defects developed when the chambers were machined. In some instances of this kind defects are not discernible even after machining, but

Pour Grids Rapidly

PROVIDED proper precautions are observed including high heads and hot metal, many castings can be poured satisfactorily in a vertical position. However, in many instances the same castings can be molded and poured quite satisfactorily while in a horizontal or in a slightly slanted position. A knowledge of all the factors involved will assist foundryman in deciding which method is best under any given set of conditions. Maintaining an open mind frequently will be of assistance to the foundryman confronted with the production of intricate or unusual castings. A typical instance shows how a hobo molder applied knowledge he acquired in one foundry to the successful production of a grid casting in another foundry where the staff had given it up.

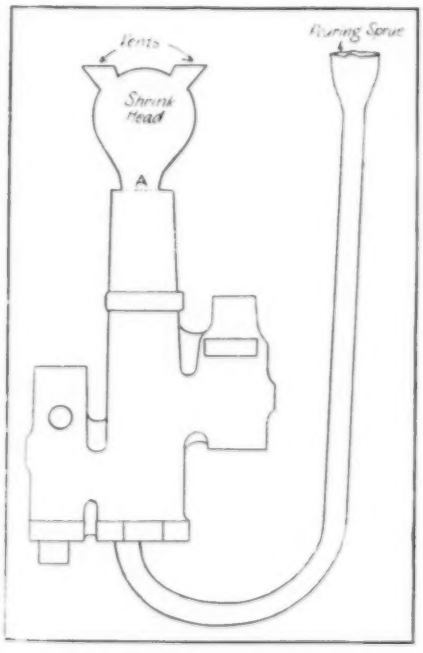


Fig. 182—Head is too low and riser neck is too small for casting poured in a vertical position

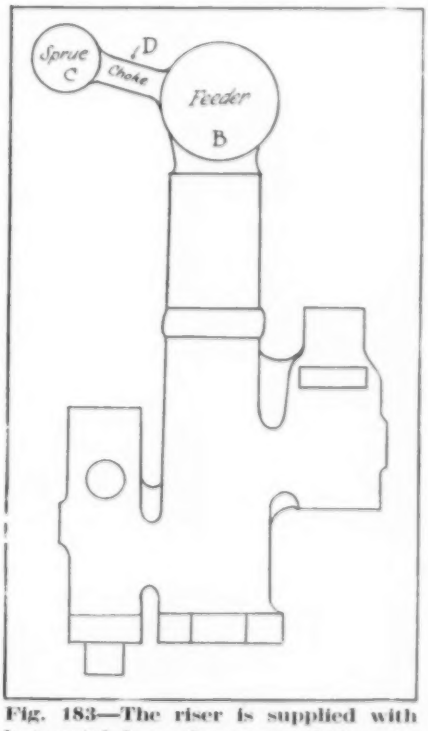


Fig. 183—The riser is supplied with hot metal from the gate and thus insures ideal feeding condition

the castings leak under pressure. In this particular instance a remedy for leaking castings was found by increasing the height and diameter of the shrink ball and by increasing the diameter at the neck to the full size of that part of the casting.

In Fig. 183, the same casting is shown arranged for pouring in a horizontal position—or, as preferred by some molders — a few degrees from the horizontal and with the gate and feeder at the high end. The vertical riser *B* is slightly larger in diameter than the body of the casting to which it is connected. Position of the sprue is shown at *C* and the gate or connecting channel between the sprue and the riser is indicated at *D*.

For occasional odd jobs this gate *D* may be cut by the molder, but where a considerable number of castings are required a wood or metal *set* gate will be found more economical and satisfactory in every respect. This feature has been touched upon before, but, as with many other important features, it will bear reiteration. The gate passage is fully as important as the mold cavity and every effort should be made to provide a passage that is clean and firm. A passage through which the metal may flow smoothly and readily.

The gate *D*, considerably smaller in area than the sprue *C* serves as a check or choke and regulates the speed at which the metal enters the mold. Also, and this is an important factor, the small passage at the bottom enables the molder to keep the sprue filled with metal and in this manner any dross or foreign material is prevented from entering the mold with the metal.

Stream Is Choked

In some instances a strainer core is employed to supplement the choke Practically every type of skimmer gate, that is a gate designed to prevent entrance of foreign material, has been described in the section of this series devoted to general practice in gray iron foundries. In many instances these gates also may be applied in brass foundry practice. Particular attention is directed to No. 11 of this series, (THE FOUNDRY, June 15, 1931).

Although skimmer gates differ in type, size and application, the object of all is the same, to prevent the entrance of dross, charcoal, coke or other debris with the metal. They depend for their success principally on the fact that foreign material is lighter than the molten metal and therefore will float where a solid column of molten metal is provided. This column of metal is provided by keeping the sprue filled to the top during the pouring operation. If the column is allowed to sink, the dross also sinks and enters the mold cavity, later to appear as a defect in the casting.

The choke feature, or in fact any of the ordinary types of skim gate, are not employed in molds for small castings. For one reason all available space in the flask is utilized for the castings to secure maximum production. Also the gates naturally are small and prevent the passage of small lumps of coke or charcoal. Furthermore it is comparatively easy to skim the small stream of metal as it leaves the lip of the pot. A large stream for a heavy casting is not controlled so readily. With some alloys a film forms across the top of the metal back of the pot lip and serves as an effectunal skimmer, but

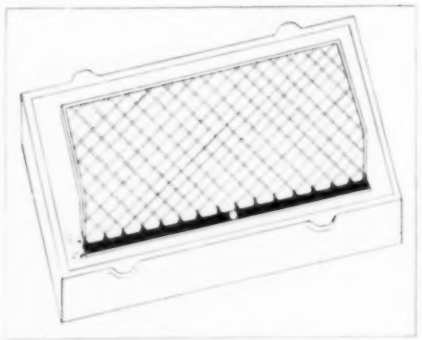


Fig. 184—Metal flowing along the wide runner F entered the mold through narrow gates G

in the majority of instances it is advisable for a man to stand by with a skimmer. The *whiskers* hanging to the lip of the crucible should be removed after each mold is poured.

The general tendency among molders is toward the use of sprues and gates that are larger than necessary. They are influenced by the desire of providing a safety factor in event the metal is duller than usual. However, with melting conditions under proper control, this contingency should not arise. Except under compulsory conditions, dull metal should not be poured into a mold. In the majority of instances it will be found more economical to pour the metal into ingots or pig beds and remelt it again and pour it into the mold at the proper temperature.

However, it is only just to point out that many men continue to use large sprues and gates through habit and custom. They never have experimented with a view of determining the minimum size that will serve. The reader who heretofore has not given this subject any consideration and who may desire to conduct some experiments for his own edification, will be interested to learn that hot iron or any metal or alloy of approximately similar fluidity and specific gravity will flow at the rate of 5 tons per hour through a $\frac{1}{2}$-inch diameter opening. A $\frac{5}{8}$-inch diameter opening will deliver 10 tons per hour, and 15 tons per hour will flow through a $\frac{3}{4}$-inch diameter opening. These figures are based on the delivery from a cupola tap hole and cannot be applied literally—for example, to a long gate in a green sand mold—but they will serve as a basis for calculation.

Up to the present, little standardization has been attempted in the brass foundry. Nearly every shop has its own methods, layout, furnaces, grades of sand and other peculiarities, developed over a period of many years. Usually each foreman or superintendent thinks his methods are best. Where his production is satisfactory and casting losses are low, he would be ill advised to change. However, the progressive foundryman always is on the alert for possible improvement. He maintains an open mind. A characteristic which can be applied to advantage in every section of the industrial field.

Adopt Best Method

General jobbing foundries offer the widest range for the molder's ingenuity and resourcefulness. In many instances the man in charge, or some member of his staff is thoroughly competent to meet any emergency that may arise. Occasionally a baffling problem arises and remains a thorn in the side of all concerned until it is solved—usually by an outsider who has had former experience with the same or a similar casting.

A description of the methods adopted to produce the casting shown in Fig. 184 will serve as a typical instance. This grid 20 x 36 inches, $\frac{1}{8}$-inch thick, framed on three sides and open on the fourth, was wanted in red brass, to show a golden color when polished. A yellow brass alloy with aluminum would not be accepted by the customer.

The pattern was not flat and straight but was bent along the center line to an angle of approximately 20 degrees. The mold was made on the floor and involved the use of a great quantity of sand and an exceedingly large flask for the amount of metal in the casting. Even if every casting passed inspection the foundryman would have lost money on them for the simple reason that he was paid a flat price per pound for a miscellaneous lot of castings ordered by the same customer.

Comment on this feature is outside the scope of the present series of articles. However, it is interesting to note that as a result of the work initiated and carried forward by various foundry associations, the archaic method of bidding a flat price per pound on a lot of miscellaneous castings is giving way to the eminently just and proper method of setting a price per piece.

(*Concluded on page* 42)

SAVE FLOOR SPACE

Sterling

Rolled Steel Flasks are compact. They economize space. They give a neat appearance on your floors.

They also save their cost in more moulds—per man—per day.

Light
Accurate
Durable

OVER 3,000 foundries have STERLINGIZED their flask equipment

STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

Milwaukee — Wisconsin

MANUFACTURED FOR THE EUROPEAN MARKETS BY:—
STERLING FOUNDRY SPECIALTIES LTD. STERLING WORKS, BEDFORD, ENGLAND

(*Concluded from page* 40)

The pattern had been rotated among the best molders in the shop without any result except an increase in the size of the scrap pile. Just as the hero in the melodrama arrives at the last moment and rescues the maiden when all hope seems lost, a wandering knight of the road drifted into this shop one morning and asked for a job. The foreman showed him the grid pattern and the scrap castings and asked him if he knew any way of lifting the hoodoo. The hobo modestly admitted that lifting hoodoos was one of his specialties. If the foreman kindly would refrain from advice or criticism, let him gate the casting and pour it according to a method he had practised elsewhere, furnish him with hot metal, why, he—the hobo—would guarantee the production of a perfect casting.

He secured a long strip of wood ¼-inch thick, 2½ inches wide and 36 inches in length and rammed it in position parallel to and about 1 inch back from the open side of the pattern. This was to serve as a runner. He set up a 2½-inch diameter sprue on the center of the runner. After the grid pattern and runner pattern were removed he cut a small narrow gate from each diamond point to the runner. The mold then was skin dried and closed.

Filled the Runner Box

The molder then made up a runner basin in an iron flask and placed it over the sprue in the cope. This runner box was lined with a mixture of clay and sand, bonded with water glass and dried. It was used thereafter in pouring several castings. The box had sufficient capacity to hold all the metal required for the casting.

Knowing the weight of the casting, the molder selected a small crucible and melted just sufficient metal to fill the mold and leave the metal at about 1½ inches high in the sprue. The metal was heated as hot as possible and handled with the greatest speed. Instead of pouring the metal in the ordinary manner, the pot was inverted over the runner box and the entire contents dumped.

Gravity and hydrostatic pressure carried the metal rapidly to every part of the mold. All the castings on the order were made successfully in this manner. Lack of pressure when the mold was filled prevented any strain. The castings conformed to the anticipated thickness and the diamond shaped openings were not marred by unsightly fins.

The finger gate of the stove plate molder is the best type of gate to use on brass stove plate patterns and other castings of like character. This type of gate already has been described. The body of the gate pattern forms a basin in the sand of the cope. Four or five small fingers extend from the body and rest on the pattern lying in the drag.

After the cope is lifted, the handle of the trowel is employed to make a small depression around each gate opening. This will form a small boss on the casting. A small stick is pushed through each gate and that treatment removes all burrs and leaves a smooth clean hole.

The most satisfactory method of pouring metal in these gates is with an iron molder's hand ladle. Small crucibles in hand shanks enable the pourers to poise over the finger gate dishes before commencing. A certain amount of skill is required to handle the metal properly and the work should not be entrusted to men without any training.

This is the thirty-fifth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The thirty-sixth will appear in an early issue.—The Editors.

Malleable Club Discusses Powdered Fuel

G. M. Goepfert, Belle City Malleable Co., Racine, Wis., was the principal speaker at the meeting of the Malleable club held at the Hotel Blatt, Milwaukee, on Oct. 11. Mr. Goepfert reviewed recent developments in the foundry industry as revealed in the technical press. The principal discussion of the evening was based on a questionnaire on the use of powdered fuel for melting malleable iron. Due to the wide interest developed, it was decided to continue the discussion at the November meeting.

Joint Meeting Features Developments

An address entitled "Cast Metal Developments in their Engineering Aspects" was presented at the joint meeting of the New Jersey Foundrymen's association and the metropolitan section of the American Society of Mechanical Engineers, Wednesday evening, Oct. 26, at the Steuben Rathskeller, Washington and Linden streets, Newark, N. J. The speaker was Sam Tour, vice president, Lucius Pitkin Inc., New York.

Subsequent meetings of the New Jersey Foundrymen's association are scheduled for Dec. 7, Jan. 25, March 22 and May 24.

Roots - Connersville - Wilbraham, Connersville, Ind., has moved its New York office to 24 State street. D. L. Dowling is district manager and N. C. Barnard and A. E. Loyd are associated with him as sales engineers.

Will Feature Round Table Discussions

Plans for coming meetings of the Connecticut Nonferrous Foundrymen's association were discussed at the regular monthly meeting of that group held at the Hotel Garde, New Haven, Conn., on Oct. 10 with C. H. Blanchard, Reading, Pratt & Cady Co., Hartford, and president of the association, presiding. C. D. Elliott, Wilcox, Crittenden Co., Middletown, Conn., is secretary of the group.

A communication is being prepared which will be sent to executives of member and prospective member companies to determine the type of meeting best suited to the needs of the industry and also to urge membership in the association. The next two meetings of the group will be in the form of round table discussions, which in the past have proved popular with those attending. Members are requested to bring gating problems for discussion and advice at the next meeting which will be held on Nov. 14 at New Haven and will be devoted to the subject of "Gating." "Aluminum Casting" will be considered at the meeting on Dec. 12.

Publishes A. S. T. M. Standards for Students

The American Society for Testing Materials, 1315 Spruce street, Philadelphia, has published *Selected A.S.T.M. Standards for Students in Chemistry, Chemical Engineering and Metallurgy.* Material presented in the 184 page book was selected with the object of presenting representative and recognized standard methods of testing some of the more common engineering materials. An effort was made to select tests that would present as wide a range of useful and practical methods as possible in condensed form.

In the section devoted to metallic materials, the following tests are given: Metallographic testing of iron and steel; chemical analysis of alloys of lead, tin, antimony and copper; and chemical analysis of manganese bronze. Refractory materials, sands, coal and coke are included in the subjects presented in the large section devoted to a wide range of nonmetallic materials.

Announce 1933 International Congress

Early announcement has been made of an international foundry congress with participation by various European foundry organizations to be held from Sept. 9 to 17, 1933 in Praha, Czecho Slovakia. This congress will be under auspices of the Czecho Slovak Foundry association.

European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Oil Fired Furnace

A New Oil-fired Furnace for Highest Cast Iron, by F. Brocke, *Foundry Trade Journal*, London, Sept. 8, 1932.

An oil-fired open-hearth furnace, known as the Schury type, recently has been designed to produce gray iron, malleable iron and steel of high quality. The furnace may have either a stationary or tilting hearth and is provided with two air superheaters which are sunk beneath the furnace. The superheaters are designed to provide hot secondary air for perfect combustion.

Approximately 20 furnaces of that type now are in operation in Germany.

Accident Prevention

Prevention of Accidents (La Prevention des Accidents du Travail), by Julien Caen. *Bulletin*, Association Technique de Fonderie, Paris, June, 1932.

First association of industrialists for prevention of accidents was founded by a group of industrialists of Mulhouse, Alsace, in 1867. After the war of 1870-71, this association ceased to function. In 1883 an association was founded in Paris which became the Association of Industrialists of France for the Prevention of Accidents. Special courses are organized at present at the Conservatoire National des Arts et Metiers, Paris, for the training of security engineers.

About 2,000,000 accidents occur annually among workers in France, and 25 per cent are due directly to machine parts. In addition there are numerous accidents due to explosions, fires and miscellaneous causes, including diseases resulting from manipulation of such products as lead, mercury, phosphorus, etc.

Importance of accident statistics, which assist in ascertaining the causes of accidents, is emphasized, as is also the importance of making known methods of first-aid particularly by easily-understood panels and posters. The leading insurance companies now organize a certain supervision, and works are visited by their own safety inspectors.

The author definitely states that by adopting proper methods, 80 per cent of the accidents could be avoided. Two groups of methods can be employed: (1) technical methods especially by various protectors or shields which are fitted to machines; (2) educational, by lectures and posters.

Cupola Process

Recarburizing Process in the Cupola (Zur Frage der Kohlungsvorgaenge im Kupolofen), by Carl Sipp and Paul Tobias, *Stahl und Eisen*, Duesseldorf, Germany, July 7, 1932.

The authors carried on an investigation with cupolas lined to 42 inches with continuous main tuyeres of 434 square inches area. In one cupola 5 single tuyeres with a combined area of 62 square inches were placed 27½ inches above the main tuyeres, and in the other 17 inches above. It was found that the lower the carbon content in the charge the higher the recarburization except where the carbon content of the charge was above the eutectic point when decarburization took place. Reactivity temperature of the coke when low increased recarburization, and as the reactivity temperature increased, recarburization decreases. Increase of silicon content in the iron decreased the recarburization. Recarburization was greater with the increase in height of the tuyere zone, and the longer the fluid iron remained in the cupola well the greater was recarburization. No effect on recarburization was noticed with variation of scrap steel size in the charges.

Casting Bearings

Manufacture of Bearings for Railroad Rolling Stock (Fabrication des Coussinets pour Voitures et Wagons dans un Reseau de Chemin de Fer), by L. Audo. *La Revue de Fonderie Moderne*, Paris, July 25, 1932.

Methods of manufacture of bearings for the French railroads are described. It is pointed out that bronze bearing shells should be molded with pattern plates, because they generally constitute repetition orders and the dimensions of the pattern plates do not vary so much as is the case with ordinary wood patterns. For melting the bronze shells, the Paris-Orleans railroad uses a specially-designed rotary furnace, which is fired with fuel oil.

Dealing with the filling of the shells with the babbitt metal, it is stated that the simplest way to pour antifriction is to fix a correctly-formed sheet inside the shell and pour the babbitt metal between the sheet and the shell. A more precise method is with a cast-iron mold, the bronze shell itself forming part of the mold. These cast-iron molds must be made with great care, and are rather unwieldy. At the author's works, a mold made partly of cast-iron and partly of sand has been devised. An illustrated description of the complete system is given.

Qualities Needed

Refractory Material in the Foundry (Les Materiaux Refractaires en Fonderie), by Dr. J. Matejka. *La Revue de Fonderie Moderne*, Paris, July 19, 1932.

A principal characteristic of refractories for foundry practice is pyrometric resistance, meaning the minimum melting point that is required. Other important qualities are required including resistance to compression, expressed by the tendency of a material to become soft under the minimum pressure prevailing at the temperature of the operation and resistance to action of flux used in the bath. The latter action takes place either by entering pores, cracks and joints of the refractory material, or by chemical action. To avoid mechanical action, a compact and well-joined material is required. Chemical action generally is avoided by glazing. The refractory usually becomes glazed in the course of use, but sometimes a glaze is added to the surface. Various methods for testing the characteristics of a material are described.

Secondary causes of destruction of refractory linings are the action of fuel and of gases, especially sulphurous gases. An important condition with regard to refractory linings is that the volume of the lining should remain constant, and also that the refractory should stand wide variations of temperature.

Western Foundryman

Gets Early Start

In Making Castings

Melvin G. Tennent

TO A certain extent the career of Melvin G. Tennent, president, Tennent Steel Corp. Inc., with head office in Tacoma, Wash., and plants in Tacoma, Seattle and Everett, Wash., and Portland, Ore., may be compared to that of the famous impersonation of the Mississippi, *Ol' Man River*, which every singer assures us keeps rollin', jus' rollin' a-a-long

Melvin has done no long distance or fancy rolling since he commenced building his present business, a business that has expanded during the past 12 years from exceedingly modest proportions to one of the largest of its kind west of Chicago. His destiny now is linked definitely with the growth and expansion of the Pacific Northwest and with that of the four cities in which his plants are located.

However, to continue the analogy, in anticipation of a period, when, like the river he should arrive at his destination, Melvin commerced rolling at an age when the majority of boys still depend on their mothers in those weekly emergencies where soap and water simply must be introduced behind the ears and below the high water mark on the neck.

Too much water in this description. The reader probably is beginning to suspect that the hero is amphibious, or that he ran away to sea in his early youth and after many adventures was eventually cast up by the waves on the stormy coast of Oregon. Neither guess is right, or, to put it another way, for the benefit of positive as opposed to negative readers, both guesses are wrong. With the exception of a voyage which carried him completely around South America, Melvin's rolling has been done on various parts of these United States.

He was born in Marietta, Ga., Sept. 10, 1885, the son of a farmer. He lost his mother when he was little more than 3 years old and like every man who has had a similar bereavement he wonders at times to what extent this factor was responsible for his subsequent career. Certainly the attributes of confidence and self reliance were developed at an earlier age than they would have been under normal conditions. At the age of 11 he set out to earn his own living, make his own way in the world, stand upon his own feet and he has been successful putting on this three-in-one act ever since. The going has been tough at times, but the training has been of incalculable assistance and he views it with pride rather than with regret.

He has acquired an education through self study and a place in the sun as prominent probably as he would have acquired had he been favored with the usual educational facilities,but he regrets the fact that he never had the opportunity of enjoying the natural heritage of every boy, a carefree period of sport and play—and a few lessons. His boyhood was spent in the grime of the foundry — many foundries — where the hours are longer and the work harder than the hours and work of the boy in the school room, but he graduated with habits of thrift and industry, with an alert and well stored mind and with the traditional iron muscles of men who pound sand, lift unbelievably heavy flasks and juggle ladles of molten metal. Judging by the brilliancy of the eyes and the lack of wrinkles in the accompanying photographic reproduction, he probably will live to be 114 years old—a regular skookum kid.

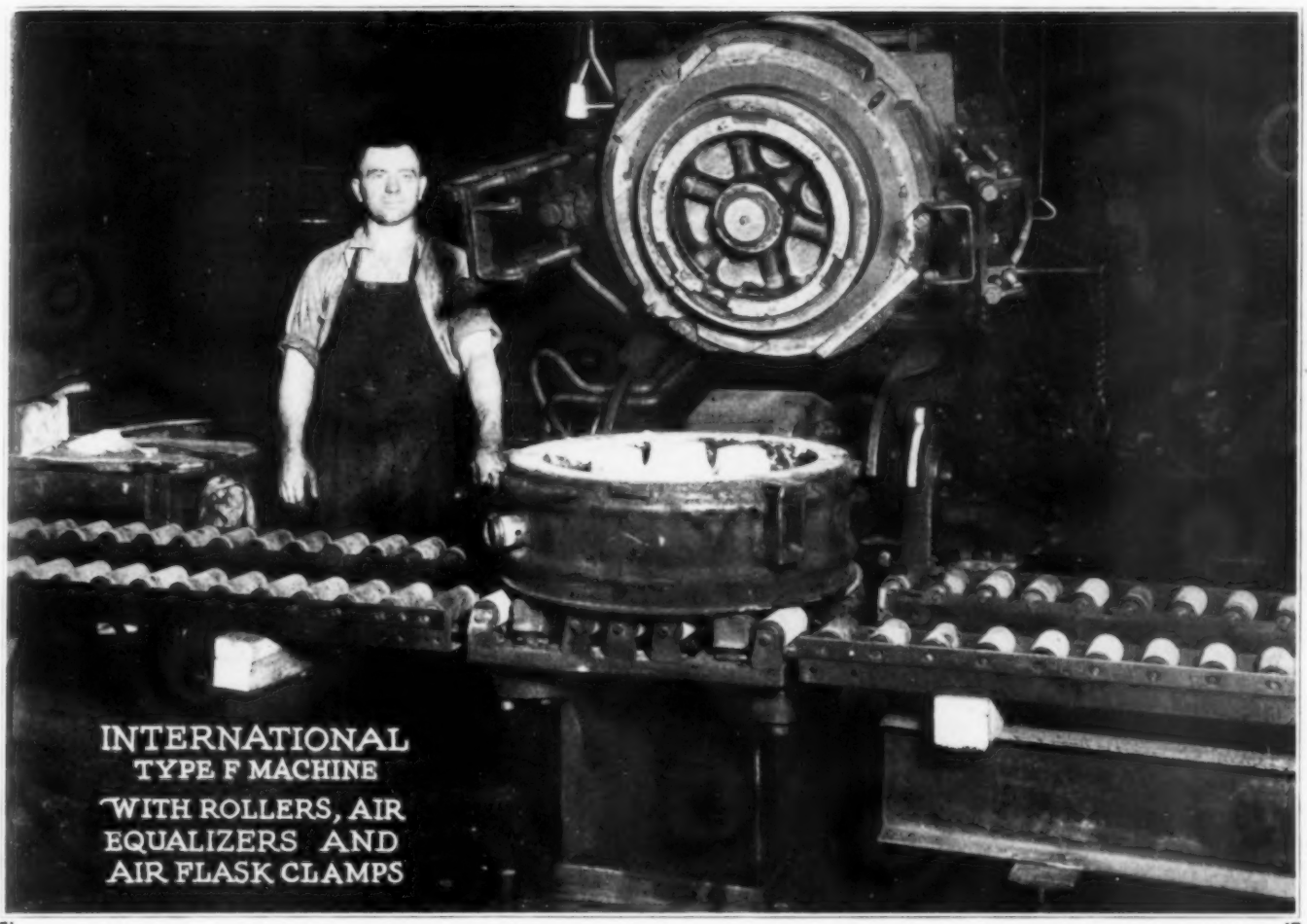
Preceding his eleventh year he spent exactly 19 days—no more, no less—in the Kirks Chapel school Kenesaw, Ga., at the foot of Kenesaw mountain. The same Kenesaw where General Sherman's encounter with General Johnson's forces led him to coin a certain famous phrase.

Available records do not show whether Melvin spent the 19 days consecutively in school, or scattered them over a period of several years. So far as the present account is concerned, the only important item is that he left home at 11 and got a job for himself as an apprentice with the Tennessee Copper & Coal Co., McKaystown,Tenn. He remained there 2 years and then spent 2 years with the Whithers Foundry & Machine Works, Atlanta, Ga.

His subsequent rambling as a young journeyman carried him for brief periods to Knoxville, Chattanooga, Tenn., and back to Atlanta, Ga. At the age of 18 he landed in Beaumont, Texas and a year and a half later took a jaunt around South America and up the west coast to San Francisco. After working in various Pacific coast foundries he was appointed foreman of the Heacock & Lawrence Iron Works, Portland, Ore. Later in turn and for varying periods he was superintendent of the Columbia Steel Co., Pittsburg, Calif., Sedro Wooley, Wash.; Olympic Steel Works, Seattle, Wash.; Aurora Foundry, also of Seattle. In 1920 he bought the old Malleable Iron & Steel Co., plant, Tacoma, and incorporated the company in 1921 as the Tennent Steel Casting Co. Inc.

Home Courses Offered by Wisconsin

The extension division of the University of Wisconsin, Madison, Wis., is presenting two home study courses covering problems of foundry practice. A course in cupola practice is offered for foundrymen, foremen, cupola tenders and molders to provide an understanding of the construction and operation of the cupola and its accessories in the gray iron foundry. Another course, foundry metallurgy, treats of the constituents of pig iron and their effects on the physical properties of castings, and the constituents of steel, malleable iron and nonferrous metals. Standard methods also are discussed. Information on the courses may be secured from the university extension division.



ALL FEATURES OF ADVANTAGE (many of which are exclusive with us) DEMANDED BY MODERN FOUNDRY PRACTICE ARE INCORPORATED IN

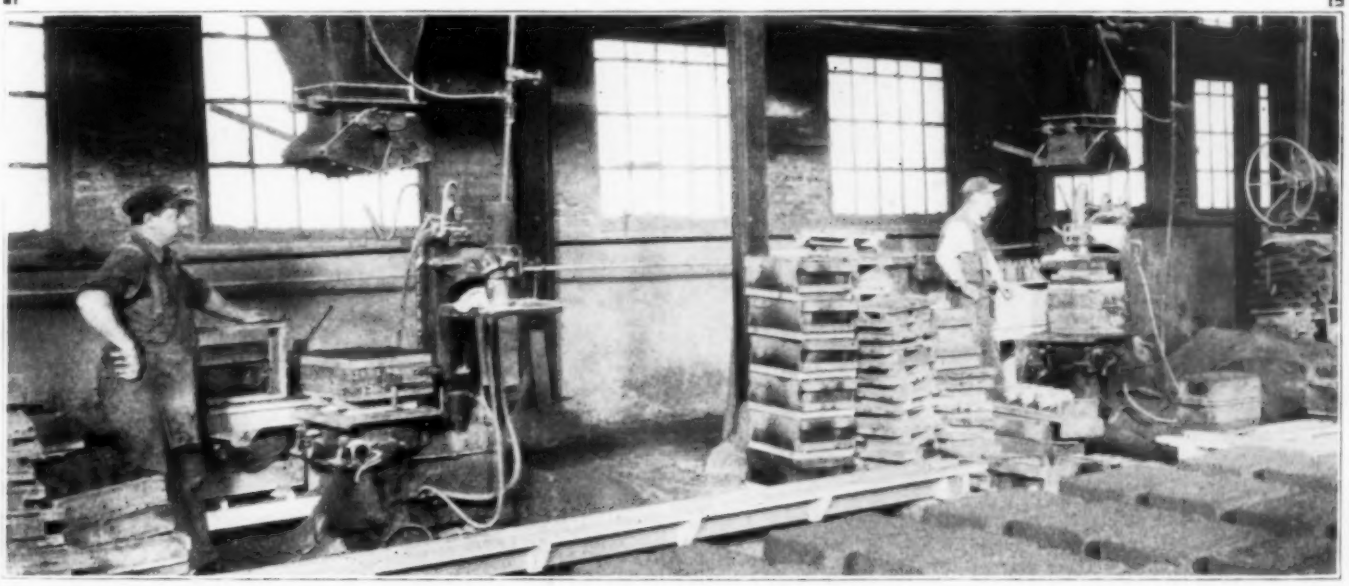
INTERNATIONALS

We claim for our 55 types of machines (3 new models recently added to our line) maximum SPEED, ACCURACY, DURABILITY, EFFICIENCY and VERSATILITY, and an entire absence of confusing complexity.

Write for a set of our Special Circulars showing a number of interesting foundry installations.

INTERNATIONAL MOLDING MACHINE CO.

2608-2624 W. 16th St., Chicago, Illinois



Add Alloys in Form of Briquets

European foundries gather interesting data on action of ferroalloys on properties of metal

By RICHARD TULL

METALLURGICAL technique of European foundries has been developed considerably during the past few years, and as a result the quality of cast iron can be improved greatly. Two broad basic facts have been observed in investigation, which are valuable in foundry operation. The first indicates that the quality of product depends upon removal or reduction of graphite nuclei or germs in liquid iron. The second shows that two heats of cast iron having the same composition and melted and cast under similar conditions will have entirely different characteristics and distinctive properties if the raw materials originate from different sources. However, these properties are to a large extent controllable.

Affect Carbon Solubility

Solubility of carbon in fluid iron is affected by various other elements in the melt. Silicon in particular reduces solubility, so by increasing the silicon content it is possible to obtain a heavy precipitation of graphite. Nickel and phosphorus have a similar effect. In the case of pig iron some graphite separates out while the iron is still in the liquid state, so that a number of graphite flakes already are present when it begins to solidify. During solidification more graphite settles out, crystallizing around the graphite particles already present and forming the relatively large flakes frequently seen in high silicon pig irons.

A pig iron of that type contains relatively coarse graphite flakes and when the iron is remelted in the cupola, the time required is not long enough to dissolve these particles completely. When the casting solidifies the same phenomena occur and large graphite crystals again are formed, interrupting the continuity of the casting in many places throughout its cross section. As a result, the strength is lowered, and the formation of cavities and spongy spots is favored.

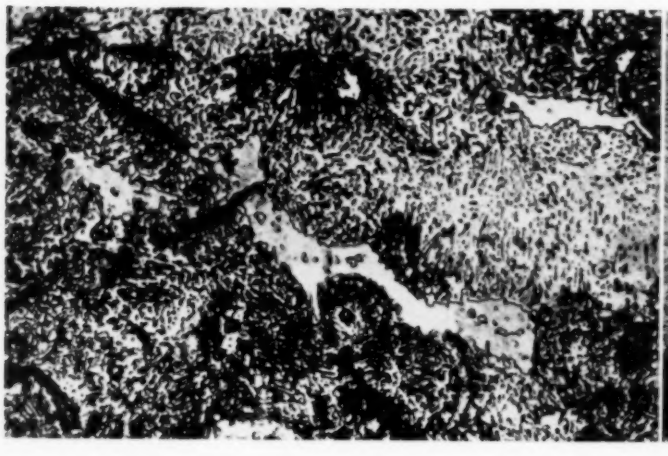
Many methods have been used for bringing into solution or removing the graphite germs. This can be accomplished by superheating the molten iron or by keeping the iron in a molten state for an extended period of time. However, neither of these methods can be carried out with a standard cupola installation without the use of auxiliary melting equipment, or exacting, careful control.

Investigations have demonstrated that as the silicon content of the pig iron is increased, the percentage of silica also is increased. The quantities of SiO_2 are considerable and may amount to 0.3 per cent or more. Consequently, cast iron with a relatively high silicon content frequently showed great hardness, while an iron containing less silicon was softer, although cast in the same molds. The presence of silica in cast iron always is undesirable.

In discussing the second basic fact regarding cast irons of the same composition made from raw materials of different sources, it is necessary to include manganese which forms a carbide that is more stable than iron carbide. That carbide always is formed when pig iron containing manganese is produced in the blast furnace.

Effect of Alloys

In a casting supposed to contain about 1 per cent manganese made by the addition of a pig iron containing 10 per cent manganese a spongy structure was shown at a change in cross section. A similar casting made by an addition of ferromanganese briquets to the charge showed that the structure at the transition point was uniformly dense throughout. Analyses were practically iden-



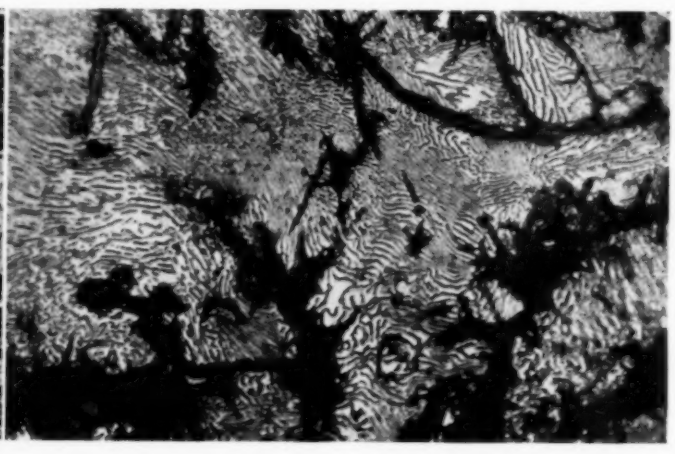


Fig. 1—Structure of casting containing chromium after reheating cycles, 500 diameters. Fig. 2—Structure of turbine housing without chromium after being in use, 500 diameters

tical, but tensile strength rose 25 per cent when a suitable grade of ferromanganese was substituted for high-manganese iron. That is evidence that the chemical composition of the iron does not by itself always determine the properties of cast iron.

Briquets consists of crushed ferroalloys which are mixed with a cement-like binder. In this country size of briquets is chosen so that they contain 2 pounds of metallic chromium or metallic manganese, or either 1 or 2 pounds of silicon. Content of alloying elements is protected by the binder from oxidation, from taking up carbon and sulphur, and from loss by burning during passage through the cupola. On melting the alloy is surrounded by a slag covering formed from the cement binder. When the molten charge is reached the slag covering remains behind in the slag and the alloy passes into the liquid iron.

Use of briquets has led to the development of production methods in various fields of application which differ considerably from those previously used. For example, small castings for sewing machine parts, stoves and furnaces, typewriter parts and electrical equipment are now made from pig iron containing a maximum of 2 per cent silicon and cast scrap, the final desired silicon content being attained through the addition of ferrosilicon.

Similar methods are employed for the production of agricultural machine parts, belt pulleys, bearings, machine tools, etc. For heavy castings, part of the cast iron scrap can be replaced by steel scrap which should be as rustfree as possible and of suitable size. Manganese briquets are adapted for that use as well as for valves, cylinders, and many parts subjected to wear, because of the great purifying action of the manganese.

Obtain Ferritic Structure

Ingot molds and slag pans have been made in Germany from low-silicon pig iron with the addition of up to 30 per cent steel scrap and about 30 per cent ingot mold scrap. Ferrosilicon and ferromanganese are used, and the silicon content is raised to 2.5 per cent or higher to insure as much stable ferritic structure as possible. A comparison of that type of ingot mold with those formerly used showed some interesting results. The old type of mold contained from 1.8 to 2 per cent silicon and 0.65 per cent manganese, while the silicon content of the new molds was 2.3 per cent. Although 25 per cent steel scrap was added, reduction in carbon content was only 0.10 per cent. Graphite content of the two molds was the same, but the structures were essentially different. Structure of the old type of mold was almost entirely pearlitic and contained coarse graphite flakes. A relatively large area of ferrite and finely divided graphite was found in the iron in which briquets were employed.

It has been found that addition to the cupola charge of 0.5 to 0.7 per cent of chromium in the form of briquets for castings used for high temperature work greatly increases resistance to heat. This addition retards the decomposition of the pearlite which is converted mainly to the granular form. Structure of a large turbine housing cast with 0.5 per cent chromium also showed that finely divided graphite and fine pearlitic structure were present in spite of heavy sections. After heating to 750 degrees Cent. (1380 degrees Fahr.) for 16 periods or ½-hour each, only a small amount of carbide was decomposed and the lamellar pearlite had been converted merely into the granular form as shown in Fig. 1.

A similar housing made without chromium contained total carbon, 3.60 per cent; graphite carbon 2.70 per cent; combined carbon 0.90 per cent; silicon 1.47 per cent, and manganese 1.05 per cent. A study of the structure after the housing had been in use showed that the graphite carbon had increased to 3.00 per cent. In other words, 0.30 per cent of carbon had separated out of the pearlite and had been deposited on the graphite flakes already present. Fig. 2 illustrates the final structure as modified by carbide decomposition.

Court of Appeals Reverses Damages Award

A court decision of momentous import to industries alleged to expose workmen to dust hazards was handed down on Sept. 29 by the United States circuit court of appeals sitting at Philadelphia, for the third circuit of the United States. This appellate court in reviewing the case of Eldred C. Butler vs. the Pennsylvania Pulverizing Co., Philadelphia, according to *Ceramic Industries* found that the defendant company was not negligent on any one of the four allegations of the plaintiff and reversed the judgment of the lower court, by which the amount of $5000 had been awarded to Mr. Butler for alleged injuries from silicosis.

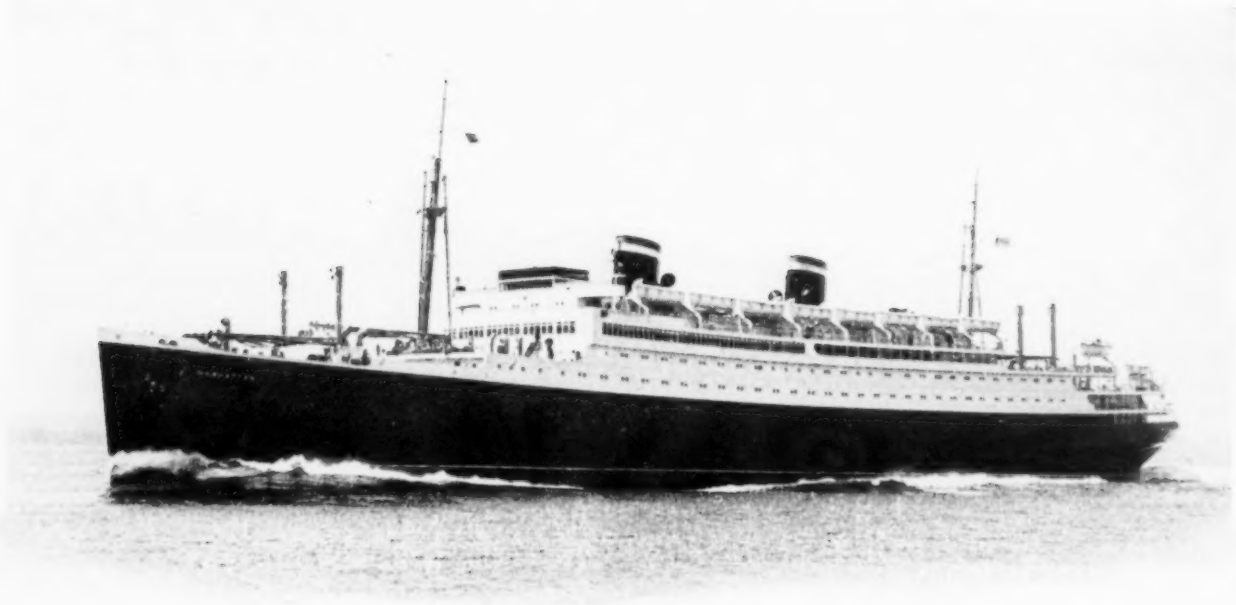
The practice of attacking industries which involve a dust hazard by instituting against them common law actions for damage is one which had its origin in 1929. Since that time it has spread with alarming rapidity until it had assumed proportions which threatened the very existence of certain industries. This activity has been especially marked in the state of New Jersey, where the disease of silicosis is not compensable under the workmen's compensation statutes and where there has been unfounded litigation of this same nature for many years.

The defendant in the case under discussion, the Pennsylvania Pulverizer Co. operates two silica grinding plants in New Jersey. This company was singled out by the attorneys who represented plaintiffs in these cases as one of the principal targets for attack. Beginning as far back as November, 1930, a long series of suits was instituted against the Pennsylvania Pulverizing Co., claiming large amounts for alleged injuries from the inhalation of silica dust. The amounts claimed in each case was $50,000, regardless of the fact that the labor turnover in the industry was high and that the plaintiffs had only worked for short periods of time and in some cases only a few days.

Only one of this series of suits against the Pennsylvania Pulverizing Co. has been tried, that of Eldred C. Butler in the aforementioned case. Regardless of the convincing testimony which was introduced by the defendant showing that every possible protection from this hazard had been provided, a jury in the United States district court at Newark, N. J., awarded Mr. Butler a verdict of $10,000. On a motion for a new trial Judge William Clarke reduced the verdict to $5,000 and commenting on the case stated, "Testimony of plaintiff's (Mr. Butler) experts on the subject of silicosis was of such character that its apparent belief by the jury indicated 'passion, prejudice, or mistake' on their part." The foremost experts on silicosis in the United States had testified at the trial that Mr. Butler was not suffering any injury from silica dust. The reduced judgment of the United States district court was appealed and the appeal was tried by the United States circuit court of appeals sitting at Philadelphia.

Employer Used Care

After a review of the complete record in the case this court found that the Pennsylvania Pulverizing Co. had not been negligent on any one of the four grounds of negligence claimed by the plaintiff. The decision pointed out that the company had used reasonable care and provided a safe place to work; that it had provided a modern and efficient dust elimination system; that it had furnished the best masks available; and that it had properly warned its employes of the danger of occupation. It would have been impossible to hand down a more complete vindication of the charges involved. Because the court had found that the company was not negligent it was not necessary to pass upon the question, whether or not the plaintiff had suffered any injury. The fact that the employer had not been negligent relieved them from any liability.



Castings Speed Fastest Cabin Liner

Many companies supply cast materials for T. S. S. Manhattan, largest merchant vessel

A SHORT time ago, the T. S. S. MANHATTAN, the largest and most elaborate merchant vessel built in the United States up to the present, was completed and placed in operation. In her first transatlantic voyage, the MANHATTAN established a record as the world's fastest cabin liner. Leaving New York pier at 1:15 a.m., Aug. 11, she arrived at Cobh, Ireland, at 9:55 p.m., Aug 16. Her official time from Ambrose Channel Light vessel to Rooche's Point, a distance of 2878 miles, was 5 days, 14 hours and 25 minutes.

A large number of American manufacturers were called upon to produce the materials and equipment utilized in the construction of the MANHATTAN. Many companies supplied the castings for various parts of the boat, while others, maintaining foundries, provided equipment in which castings are used. The following companies, operating foundries are included in the list of firms having a part in the building of that ship which stands as a milestone in the building of merchant marine:

American Abrasive Metals Co., New York; treads for wood ladders.

American Engineering Co., Philadelphia; main steering gear, auxiliary steering gear and capstans.

Aluminum Co. of America, Pittsburgh; aluminum floor plates, aluminum castings.

American Manganese Bronze Co., Holmesburg, Philadelphia; brass fittings, bronze castings.

American Locomotive Co., New York; vertical sliding windows.

American Radiator Co., New York; steam and hot water radiators.

Atlantic Steel Castings Co., Chester, Pa.; miscellaneous steel castings.

Buffalo Meter Co., Buffalo; fuel oil meters, water meters.

H. Belfield Co., Philadelphia; brass pipe fittings.

A. & F. Brown Co., Elizabethport, N. J.; siren.

S. F. Bowser & Co. Inc., Fort Wayne, Ind.; sight flow boxes.

Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.; metaline oil-less bearings.

Bethlehem Steel Co., Bethlehem, Pa.; centrifugal cast bronze tail shaft sleeves.

Cutler-Hammer Inc., Milwaukee; electrical control quipment for watertight power doors, throw-over switches for emergency switchboard.

Crane Co., Chicago; pipe fittings, white metal fittings.

Chicago Pneumatic Tool Co., New York; motor driven air compressors.

Chapman Valve Mfg. Co., Indian Orchard, Mass.; cast steel gate valves.

Crouse-Hinds Co., Syracuse, N. Y.; voltmeter switch for main switchboard.

Central Iron & Steel Co., Harrisburg, Pa.; steel washers.

Consolidated Ashcroft Hancock Co. Inc., Bridgeport, Conn.; safety valves.

Cochrane Corp., Philadelphia; conduit fittings.

Cramp's Brass & Iron Foundries, Eddystone, Pa.; iron castings, bronze castings, manganese bronze propeller wheels.

Crucible Steel Castings Co., Lansdowne, Pa.; miscellaneous steel castings.

Camden Foundry Co., Camden, N. J.; miscellaneous iron castings.

Crown Smelting Co., Chester, Pa.; miscellaneous bronze castings.

DeLaval Separator Co., New York; lubricating oil separators.

Dodge Steel Co., Tacony, Philadelphia; miscellaneous steel castings.

Deemer Steel Casting Co., New Castle, Del.; miscellaneous steel castings.

DeLaval Steam Turbine Co., Trenton, N. J.; main and auxiliary feed boiler pumps.

Erie Forge Co., Erie, Pa.; turbine castings.

Falk Corp., Milwaukee; main reduction gears, main turning gears.

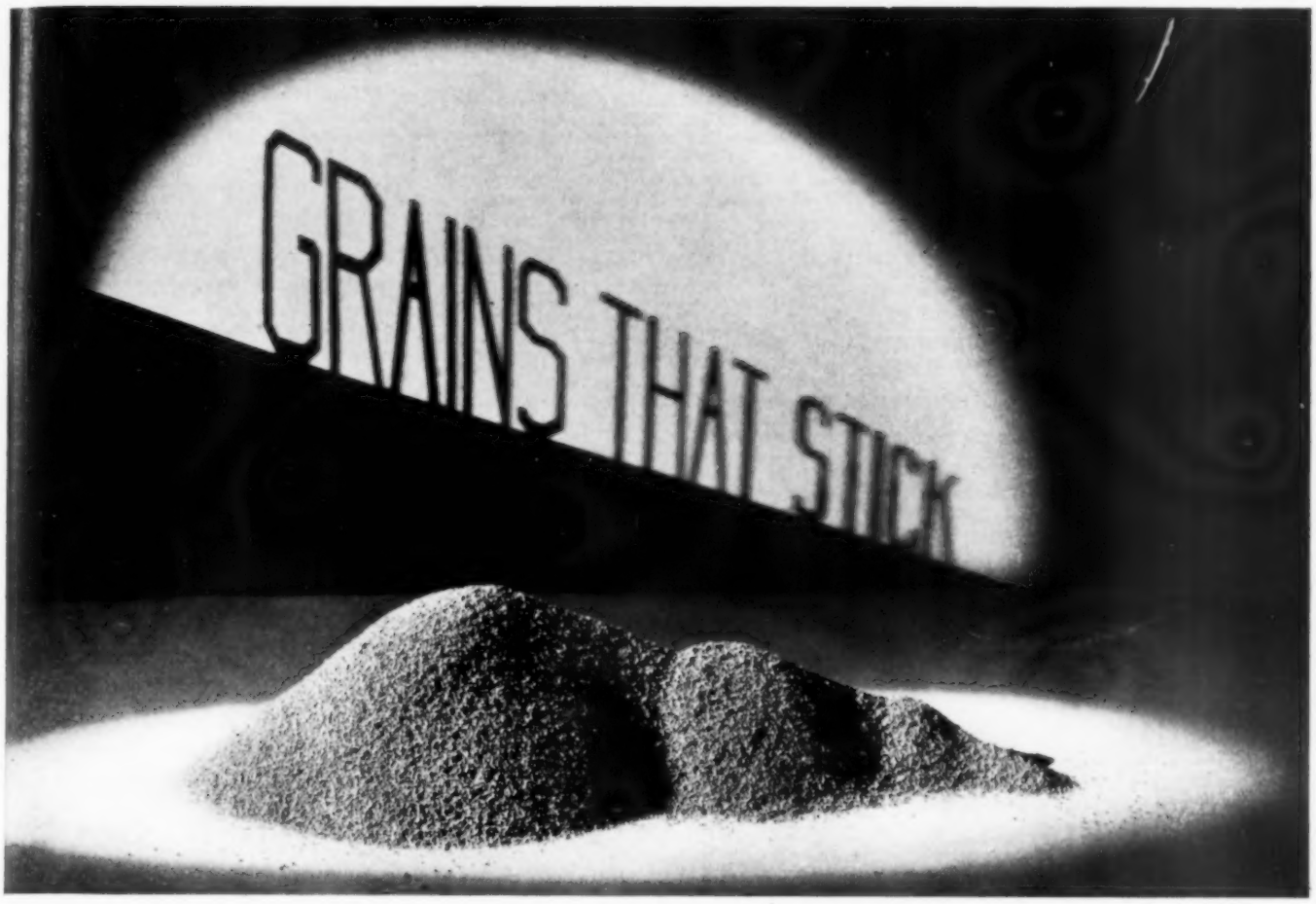
Fowler & Wolfe Mfg. Co., Norristown, Pa.; steam wall radiators.

H. S. Getty & Co., Philadelphia; white metal and bronze marine joiner hardware.

General Electric Co., Schenectady, N. Y.; circuit breakers for main switchboard.

Goubls Pumps Inc., Seneca Falls,

(*Concluded on page* 50)



HIGH CAPILLARITY GRAINS MAKE STRONG POLISHING WHEELS

NORTON POLISHING ABRASIVES

CAPILLARITY is one property of abrasives which largely determines the strength of a polishing wheel.

High capillarity grains make strong wheels because the glue is spread evenly through the grains; and each grain is held firmly, as securely as its neighbor.

Norton polishing abrasives are specially treated to raise their capillarity; and so handled that this capillarity is maintained. They stick firmly in the wheel head until all their work is done.

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia Pittsburgh Hartford Cleveland
Hamilton, Ontario London Paris Wesseling, Germany

G-6

NORTON PRODUCTS — Grinding Machines; Lapping Machines • Grinding Wheels; Abrasives for Polishing; India Oilstones, Pulpstones • Laboratory Ware, Refractories; Porous Plates • Non-slip Tiles and Aggregates

(*Concluded from page* 48)

N. Y.; hand pumps.

Wm. Highton & Sons Co., Nashua, N. H.; registers.

Hajoca Corp., Philadelphia; pipe fittings.

Lidgerwood Mfg. Co., Elizabeth, N. J.; motor driven winches.

Lunkenheimer Co., Cincinnati; cast steel, gray iron, bronze and monel metal valves.

Leslie Co., Lyndhurst, N. J.; pressure regulating valves, pump governors.

Lovell-Dressel Co. Inc., Arlington, N. J.; desk lights, lamp type indicators.

Lebanon Steel Foundry, Lebanon, Pa.; miscellaneous steel castings.

National Malleable & Steel Castings Co., Cleveland; cast steel anchor chain cables..

Otis Elevator Co., New York; elevators.

Penn Steel Castings Corp., Chester, Pa.; steel castings.

Pusey & Jones Corp., Wilmington, Del.; iron main condenser castings.

Sargent & Greenleaf Co., Rochester, N. Y.; combination locks.

Sterling Steel Foundry Co., Braddock, Pa.; steel stern frame, stem and rudder castings.

Shenango-Penn Mold Co., Pittsburgh; centrifugal cast bronze castings.

Sterling Bronze Co. Inc., Long Island City, N. Y.; electrical fixtures for public spaces and staterooms.

Standard Steel Works Co., Burnham, Pa.; miscellaneous steel castings.

Star Brass Mfg. Co., Boston; relief valves, whistles, gauges.

Simmons Co., New York; metal beds, springs, Pullman berths.

B. F. Sturtevant Co., Boston; forced draft blowers, hull ventilation sets.

Sperry Gyroscope Co., Brooklyn, N. Y.; gyro pilot and rudder indicator, gyro compass, searchlights, shaft revolution indicator system.

Trenton Malleable Iron Co., Trenton, N. J.; miscellaneous malleable iron castings.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; electric motors, controls and electric equipment anchor windlass, motor driven pumps, air compressors, main turning gears, steering gears and capstans, winches, etc.

D. T. Williams Valve Co., Cincinnati; brass gate valves, water gage fittings, pet cocks.

Worthington Pump & Machinery Corp., Harrison, N. J.; reciprocating pumps, turbine driven centrifugal pumps, motor driven centrifugal pumps, and motor driven triplex pumps.

Yale & Towne Mfg. Co., Stamford, Conn.; bronze cylinder locks, padlocks.

Making Manganese Bronze

(*Concluded from page* 29)

results: Bar 1; tensile strength 88,400 pounds per square inch; elongation, 20 per cent in 2 inches; reduction of area, 24 per cent. Bar 2, tensile strength, 90,600 pounds per square inch; elongation, 25 per cent in 2 inches; reduction of area 24.2 per cent.

The metal then was remelted, flared for 15 minutes, 1 per cent additional zinc was added, and cast-to-size test bars were made in sand molds.

Physical properties were as follows: Bar 1; tensile strength, 89,900 pounds per square inch; elongation 26 per cent in 2 inches; reduction of area, 26.8 per cent. Bar 2; tensile strength, 90,000 pounds per square inch; elongation 27 per cent in 2 inches; reduction of area 24.9 per cent.

Fracture of a good manganese bronze should be reddish, not white. In making manganese bronze, it is best to melt it twice. The first melt from the virgin metals should give tensile strength, but the metal may be low on elongation. Tensile strength on first melt is safer if it is 10,000 pounds higher than required by specifications. With a metal of 80,000 pounds per square inch tensile on the first melt, and 20 per cent elongation, it is easy to get 70,000 tensile and 40 per cent elongation on the remelt. On the other hand, if the tensile on the first melt is only 68,000 or 70,000 pounds with 15 per cent elongation, the chances of increasing the elongation on the remelt are not good.

The aluminum bronze hardener carries every alloying element into the copper, except zinc. Since the hardener is soluble, material such as sheet brass can be used to make the bronze. Using sheet brass of the composition 70 per cent copper, 30 per cent zinc, the following mixture may be used: Brass clippings (70-30), 75 pounds; zinc, 18.50 pounds, hardener, 6.50 pounds. For a higher tensile the formula must be changed to allow 10 per cent hardener. Some foundries are melting the hardener and scrap brass together, using a portion of the scrap charge to cut down the hardener, and the other portion to cool it.

It is best to reserve a portion of the brass for cooling so that when zinc is added it will not smoke excessively. The entire amount of copper required is contained in 75 pounds of 70-30 scrap, when 6½ pounds of hardener is used. Zinc does not need to be particularly low in lead when used to make bronze by this process. For ordinary ship propellers a zinc containing over 1.5 per cent lead has been used. It also contained 0.5 per cent of cadmium. These castings were required to have 68,000 pounds per square inch tensile and not under 28 per cent elongation and none were lost. When higher physical properties are demanded, the hardener is increased to 10 per cent.

One founder using this method of making manganese bronze takes the following for a 500-pound heat: Copper, 245 pounds or 49 per cent; hardener 50 pounds or 10 per cent; zinc, 205 pounds or 41 per cent. The heat is ingoted. On the remelt 2½ pounds additional zinc is added to the 100 pounds of ingots. The zinc flares strongly 15 minutes. In remelting gates and return scrap, another 2½ pounds of zinc is added for each 100 pounds of scrap. The following results are secured consistently. Heat 1: tensile strength 83,100 pounds per square inch; elongation, 22 per cent in 2 inches; reduction in area, 20.4 per cent. Heat 2, tensile strength, 78,100 pounds per square inch; elongation 25.0 per cent in 2 inches; reduction of area, 23.8 per cent. It is an easy matter to make manganese bronze with the use of this hardener. Of course, casting the bronze is another matter, but manganese bronze made by this method is no more difficult to cast than any other manganese bronze. Much better results than those cited in the article have been obtained by many founders and such superior results are obtained by zinc additions. Some founders consistently obtain over 90,000 pounds ultimate strength, with good elongation.

Wisconsin Group Studies Cupola Control

A. W. Weston, metallurgist, Chicago Hardware Foundry Co., North Chicago, Ill., spoke on "Simplified Method of Weighing and Controlling Cupola Air" at the regular meeting of the Wisconsin Gray Iron Foundry group held at the Hotel Schroeder, Milwaukee, Oct. 19. Mr. Weston outlined a method of controlling cupola air with the positive pressure blower. He showed figures indicating results obtained, and economies and thermal efficiency effected.

Specifications for Gray Iron Discusses

Gray Iron institute, Cleveland, through its technical department, is issuing a series of technical bulletins discussing the important ramifications of the specifications for gray iron castings as adopted at the 1932 annual meeting of the American Society for Testing Materials. The first report contains a reprint of the specification, which is designated the A 48-32 T, as well as a short review of some of the factors included in the specification.

F. B. Coyle, research metallurgist, International Nickel Co., New York, addressed the New York chapter of the American Society for Steel Treating at the Merchant's Association of New York assembly room, Woolworth building, Oct. 10, on "Heat Treat Fundamentals of Plain and Alloy Cast Iron."

Scan Benefits of Code

Foundryman states new gray iron specifications improve position of buyer and seller alike

VARIOUS considerations attending the adoption by the American Society for Testing Materials of tentative standards for gray iron castings probably are not entirely appreciated by foundrymen. Of course, it is significant that radical changes have been made in tests intended to develop the superior properties of gray iron under the best modern procedure of manufacture. Furthermore, the introduction of classifications ranging from 20,000 to 60,000 pounds per square inch tensile superseding all the individual specifications previously existing carrying a maximum of only 28,000 for high test iron, indicates an advance standard.

Wherein these factors are of definite benefit to the manufacturer of castings perhaps is not clearly and generally understood. Therefore, a series of questions submitted to the president of the Gray Iron institute, which organization was active in furthering the adoption of these specifications, may be of distinct value in appraising the far reaching effect of the new tentative standards.

Presents His Views

A. E. Hageboeck, president of the Gray Iron institute, is a practical foundryman, president of the Frank Foundries Corp. operating shops in Moline, Ill. and Davenport, Iowa. He has been identified with the institute since its organization, is recognized as an able operating and sales executive. Mr. Hageboeck's views on the specifications follow:

Question 1. *What are the general advantages of the new specifications to producer, consumer and the general public?*

The proposed standards in effect give gray iron a new recognition through pointing definitely to attainable physical properties. The use of such specifications removes an element of uncertainty in buying and selling castings. The classification graded upon a grouping of physical characteristics aids the designer in designating the proper iron to be used in castings for specific services. The use of a designated and specified grade removes misunderstandings which may lead to complaints and in many cases will actually prevent failures. Buyers like to be assured of the quality of the material they purchase and foundrymen have a vital interest in maintaining quality and uniformity within a given class, necessary to meet specified service conditions.

Lists Important Factors

Due regard for the service conditions of the required castings is important. Finish, ease of machining may be the major factor in one case. High strength may govern in another instance. In any case the new specifications permit the buyer to elect the proper castings for his need. They also designate for the foundrymen the right classification under which to manufacture.

Question 2. *Will the new specifications have an effect upon castings prices?*

One very troublesome condition encountered in selling castings is the absence of any accurate and recognized measure of worth. A buyer who is not well informed may be misled by a mere price consideration and may fail to obtain the castings which are required for his service. Those special irons which it is now possible to provide require special treatment or special materials that add to the price. Where certain expensive melting methods or procedure or expensive alloys are required, or where **improved technique** and **supervision** is applied to pattern-making, molding, heat treatment or inspection, the foundry is entitled to a better price. The specifications draw a clear demarcation and will enable the foundryman to point out these items which serve to increase costs and which entitle him to expect and demand a better price.

Question 3. *What are the definite sales advantages provided by the new specifications?*

The mere enumeration of attainable properties has a distinct advantage. It adds prestige to a product which has not been clearly appreciated by users or engineers. The specifications definitely raise the standards for gray iron castings. Furthermore, they enable the designer to establish factors of safety and to specify gray iron in many uses previously not considered within the scope of gray iron. By providing a definite and recognized check on quality for buyer and seller, misunderstandings are avoided as previously noted. The enumeration of properties in relation to various sections of metal encountered is entirely new and gives added weight to the advantages claimed by the seller. However, the chief advantage is in providing a common denominator, a definite and recognized series of properties that will be clear to buyer and seller alike.

Advantage To the Buyer

Question 4. *What are the advantages to the buyer of gray iron castings?*

Of course, any buyer has a right to expect the seller to enumerate the qualities of the product that he offers. The specifications through their use and general recognition will furnish a measure of quality previously unattainable. Furthermore, the buyer will be protected in large measure from the error of choice which might be encountered under the old practice of buying merely gray iron castings. This does not imply any unscrupulousness, but rather that by defining properties, the buyer may be fully informed and his needs more readily met. Obviously, a special alloy or special treatment iron falling within certain classification ranges may not be needed for the service requirements of some buyers. These buyers should not be expected to pay the necessary premium to obtain this quality if the higher properties are not imperative. Conversely, the buyer is protected from those who might offer castings unsuited to his uses where there is no measure by which he could determine such standards. Competition upon price basis alone is harmful to buyers and sellers

alike. In this instance, the buyer is protected from those who may be unfit through unavoidable circumstances to meet his needs.

Obituary

JOHN A. OBERHELMAN, 70, founder of the J. A. Oberhelman Foundry Co., Cincinnati died recently. He had retired from the foundry but was vice president of the King Machine Tool Co., Cincinnati.

Clarence E. Fowler, manager, Toronto branch office of the Independent Pneumatic Tool Co., died recently.

John A. Engle, general superintendent, pattern department, J. I. Case Co., Racine, Wis., 1912 to 1927 died recently.

Henry J. Karges, president, Indiana Stove Works, Evansville, Ind., and for several years president, National Stove Manufacturers' association died recently.

H. J. Eisaman, 74, for many years associated with the former A. Garrison Foundry & Machine Co., Pittsburgh, which is now a part of the Mackintosh-Hemphill Co., Pittsburgh, died at Brownsville, Tex., Oct. 16.

C. A. W. Vollrath, 73, president, Vollrath Co., Sheboygan, Wis., pioneer manufacturer of enameled steel and cast iron wares, died recently after an illness of two years. He was born in Sheboygan and at 15 entered the Vollrath plant, founded by his father, Jacob Vollrath.

Clarence A. Scott, 55 connected with the Simplex plant of the American Steel Foundries, Chicago, formerly western representative of the Pittsburgh Grinding Machine Co., and brother of George E. Scott, president of the American Steel Foundries, died at Chicago, recently.

A. H. Thorn, manager of industrial relations for the Peoples Gas Light & Coke Co., Chicago, died of a heart attack Oct. 11 in Atlantic City where he was attending the convention of the American Gas association. Mr. Thorn who was 55 years old had been identified with the company for 38 years.

William Laidlaw, president and manager, William Laidlaw Inc., Belmont, N. Y. manufacturers of metal cutting band saws and special machinery, died recently. Mr. Laidlaw was born in Sheffield, England, Sept. 29, 1880. In 1905 and 1906 he was foreman of the Clark Tool Works, Inc., Belmont, N. Y., and later moved to Whitewater, Wis. He served in France during the War and later returned to Belmont where he became connected with the shop which he later purchased.

Tinius Olsen, founder of the Tinius Olsen Testing Machinery Co., Philadelphia, died recently in that city at the age of 86. He was the oldest living life member of the Franklin institute of Philadelphia, from which he had received the John Scott and Elliot Cresson medals. Mr. Olsen was a pioneer in the development of testing machinery in this country. Upon him recently was conferred an honorary citizenship in his birth place, Kongsberg, Norway, and he also was decorated by the King of Norway as a commander knight of the order of Olaf.

William R. Stedman, 70, Stedman's Foundry & Machine Works, Aurora, Ind., died Oct. 3. Mr. Stedman was born Feb. 3, 1862 and received his early education in the public schools of Aurora. Later he attended the old Chickering institute, Cincinnati, and also business college in that city. After the death of his grandfather, N. R. Stedman, who founded the Stedman Foundry & Machine Works, he became associated with his father and brother in the ownership and management of the business. In 1905 he retired from active business when his brother G. M. Stedman took over the entire interests of the firm.

J. Little, 70, past president, Institute of British Foundrymen, died at Southport, England, recently. Mr. Little, the son of a London foundryman, started work at the age of 13 as an office boy at Cammell Laird's Grimesthorpe Works, Sheffield, where his father was foreman patternmaker. At the age of 15 he entered the pattern shop and a few years later passed into the drawing office. He spent a short work period at the Penistone and the Workington Works of Cammell Laird and in 1902 was appointed general manager of the Grimesthorpe Works. Mr. Little was president of the Sheffield branch of the Institute of British Foundrymen for 2 years, and in 1919 became president of the institute, succeeding the late T. H. Firth of Brightside Foundry.

Book Review

Foundrywork and Metallurgy, Vol. IV, edited by R. T. Rolfe, imitation leather, 229 pages 5 x 7½ inches, published by Isaac Pitman & Sons, Ltd., and supplied by THE FOUNDRY, Cleveland, for $1.75 plus 15 cents postage and in Europe by the Penton Publishing Co., Ltd., Caxton house, Westminster, London.

Melting, one of the major problems of foundry practice, receives the principal attention in this section of the series on foundrywork and metallurgy; the remainder of the volume being devoted to information on brass and bronze casting and chilled cast iron for rolls. Considerable data is presented on the design, operation and the reactions obtained with the cupola. This discussion includes information on several special types of cupolas, including two illustrations and a brief description of the balanced blast cupola, a unit having auxiliary tuyeres, which was developed some time ago by the British Cast Iron Research association.

Mr. Rolfe, the author of the section on melting, also discusses other types of melting units, including the reverberatory furnace, the rotary furnace the crucible furnace, noncrucible furnaces and electric melting units.

The section on "Brass and Bronze Melting" by H. C. Dews presents technical information pertaining to the subject. It is to be regretted that this section was not extended to include many more of the practical problems constantly confronting the nonferrous foundryman. The discussion of chilled cast iron for rolls by Archibald Allison is a valuable addition to the volume.

Reviews Methods For Testing Cast Iron

The International committee for cast-iron testing methods met in Paris during the Fourth International Foundry congress, Professor A. Portevin, chairman of the committee, presiding. Nine countries were represented: Belgium, Czecho-Slovakia, France, Germany, Great Britain, Italy, Spain, Switzerland, and the United States. The American Foundrymen's association was represented by R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee assisted by Vincent Delport, THE FOUNDRY, London.

The minutes of the previous meeting, held in Milan, Italy, in September, 1931, were formally adopted.

An interesting discussion took place on various points arising from the different testing methods which are being investigated at the present time. The principal speakers were: Professor Portevin, Major Nicolau and A. Le Thomas, for France; Dr. Ing. G. Meyersbeerg, for Germany; J. Leonard, for Belgium; Professor Pisek, for Czecho-Slovakia; C. E. Navarro, for Spain; J. C. Pearce, for Great Britain.

After Professor Portevin had summarized the position as it stands the committee declared itself in agreement on the following points, with the provision that the questions be referred to the associations represented: For the engineer, the study of a casting after service can only be effected on test-pieces taken from the casting; for the foundryman, the control of the iron requires separate test-pieces.

It was agreed that it is necessary to investigate both methods of testing concurrently: (a) by small test-pieces taken from the casting, which would be used to qualify the characteristics of the casting itself and its homogeneity; (b) by larger test-pieces cast separately, which would be used for the qualification and the control of the metal in the foundry.

It was agreed that the best test-methods in each case must be investigated, and the cast-iron should be tested independently of commercial or

national considerations. It was stated that one of the most interesting tests, where it is possible of application, is the transverse test. It was agreed that the investigations should be conducted to find out the best testing methods, the conditions under which the tests should be made, the most favorable dimensions for test-pieces, and the conditions of the preparation and obtaining of the test-pieces.

Investigations are also to be made to ascertain whether there exists any definite relation between characteristics obtained from different tests, such as the tensile and the transverse test; and whether there are any relations between the characteristics of one given test for different dimensions of a test-piece.

The committee also decided that each technical foundry association should make an inventory of the literature and of the specifications existing in its country, and that all this material shall be sent to the president or secretary of the International committee, that a complete bibliograph of the work effected on the subject of the testing of cast iron be made available for the various associations, with a view to facilitating their investigations and avoiding duplication of work to as great an extent as possible.

Previous Experience of Driver Dictates Training Program

SPECIAL emphasis has been given to careful selection of truck drivers. (THE FOUNDRY, August and October, 1932) While some will recognize it as logically sound and sensible, others may be inclined to regard it as unnecessary initial expense, reasoning that they can find out quickly all that they want to know about a driver after he is put to work. Sometimes they do—to their sorrow. Experience shows that it is worth the extra cost to determine an applicant's qualifications and ability as fully as possible before he is entrusted with a truck.

Examine Drivers Experience

Instructing the new driver in his duties is an important step that unfortunately too often is slighted. The new driver's instructions and preparations before going into service should be governed by the following factors: No previous experience; previous experience but in a different line; previous experience in the same line.

Some will not hire drivers having no previous experience. If all followed that policy those ambitious to become drivers would have a hard time getting started, so perhaps that policy should not be advocated too strongly. As a compromise a certain amount of raw material may be used, but in general preference should be given to those who require less breaking in.

Nevertheless sight should not be lost of certain advantages held by a practically green driver. He is more willing to be taught and absorbs instructions faster and more thoroughly when he has nothing to unlearn; whereas the more experienced driver may have his own ideas as to what should be done and may be less amenable to the new employer's program in regard to truck handling.

How should the driver with no previous experience be trained? Today few boys reach manhood without learning to drive some kind of a car. Therefore, the applicant probably knows the hand and foot work of driving. He may be weak on theory and quite lacking in truck practice so the mechanical superintendent should explain the truck, part by part and discuss the functions of each. The new driver should be told what to watch in connection with the mechanical equipment, without confusing him with too much detail that should be left to the shop and garage men. It is not a bad idea to have him work around the garage for a while before he starts to drive, perhaps acting as a helper for the maintenance crew.

When he first goes out on the truck it should be as an observer with an expert driver at the wheel. If the vehicle is of a kind that normally carries helpers he may be kept in that position for some weeks or even months, particularly if there is much for him to learn about duties other than driving, routes, loading and unloading of goods, customers contacts, etc. Finally he should change places with the expert driver, the latter watching and correcting his mistakes. During this time he should be receiving instructions from foremen who have to do with any other responsibilities of drivers outside of handling trucks.

The safety director, if there is one, also should be sure that the driver has learned the rules for safe handling of trucks, which the company should have in printed form, either of their own or obtained from the state motor vehicle bureau. An oral examination from time to time will reveal familiarity with these rules and knowledge of what to do to avoid an accident and in the event of one how to report it to the company later.

When the driver has shown sufficient aptitude in the judgment of his immediate supervisors he may go out as a full fledged driver. The management should receive reports from time to time as to the progress made by a driver so that he may be advanced when opportunity offers and compensated accordingly.

Less Instruction Required

If the new employee has driven a truck in another field of work preliminary instructions will be simpler. If he has driven the same class of truck, particularly if he has driven the same make, the garage instruction may be omitted, although a little quiz by the mechanical superintendent would not be out of order. Most time should be spent on the business angles of the job. The new man should go out as a helper for a time at least with an older driver unless he is already familiar, both with the kind of truck he is to drive and the territory he is to cover. He should likewise have his sessions with the traffic manager and the safety director or the man or men performing those functions.

The driver who has worked for a company in the same or a similar line of business may be passed through the preliminary school faster but should spend enough time in each division to make sure that he has the necessary foundation. In outline the preliminary training is essentially the same for all three classes of new drivers. The differences are only in the time given to each part of the training depending upon how much the man already knows.

All drivers are salesmen to an extent. Even if they are not selling goods they are selling or unselling, their house to the public. So teaching courtesy always should be included in the preliminary and after training of drivers. It pays never to let up stressing courtesy and insisting that it be shown everyone—not simply customers but all other motorists and pedestrians because their good will is an asset whether or not they are prospective customers.

Adopts Specifications

Federal specifications board has adopted officially a number of specifications for castings which will be mandatory upon all departments and independent establishments of the government after Dec. 15, 1932. Specifications include QQ-B-621 covering commercial and naval brass castings, QQ-B-691 for bronze castings and QQ-B-726 for bronze and manganese castings.

Iron for Pressure Castings

(*Continued from page* 25)

Table III gives the analyses of hard-iron samples taken from the spout at 5 minute intervals during a short heat, all of which was tapped into one ladle, this fact offsetting the wide variation in analyses.

Seventy-five hundred pounds of the hard iron of Table III was mixed with 2000 pounds of soft iron having the following analysis: Silicon 2.40 per cent; sulphur 0.085 per cent; manganese 0.55 per cent; phosphorus 0.45 per cent; total carbon 3.50 per cent. The analysis of the resultant mixture, which was poured into a line-pump cylinder, from which the sample was taken, was as follows: Silicon 1.70 per cent; sulphur 0.105 per cent; manganese 1.09 per cent; phosphorus 0.152 per cent; total carbon 2.74 per cent; graphitic carbon 1.99 per cent; combined carbon 0.75 per cent.

Casting Cools Slowly

The sample was taken through the 2¼-inch wall of the cylinder, this cylinder having 5¾-inch bore and weighing 2300 pounds. It will be seen readily that a casting of this size would cool slowly. Physical data obtained from this casting are shown in Table I. Mixtures given previously are for one specific job. The figures of Table II show the range of mixtures used.

An examination shows that the iron is distinctly of pearlitic structure, with no free ferrite and only occasionally free cementite. The graphite exists in short flakes and is nicely broken up. A fracture through a heavy piece shows a remarkably uniform grain structure throughout.

This iron has fulfilled all of our requirements. Over 1000 cylinders of various kinds cast from this metal are in service, operating at pressures of from 450 to 1500 pounds per square inch. It is over 5 years since the first one was placed in service, and as yet we have had no breakage reported from the field.

Each cylinder is checked before it goes to the machine shop for chemical analysis, shear strength and graphite distribution, all of which are determined from a sample cut from the wall of the casting itself. These three checks enable us to discard any cylinder which may be off owing to poor foundry practice. We can detect faulty cupola practice instantly by these tests.

Behind this method of producing high test iron is the idea that melting the steel in one cupola and tapping all of it into one ladle enables us to gage the carbon content of our final mixture. There is nothing in the steel burden to throw us off, because the burden materials never change, nor does the cupola operation. Soft iron analysis is held uniformly close to specifications from day to day, and more important still is the fact that the quantity used is weighed out accurately. Thus, its effect on the final analysis is known beforehand.

The coke bed may seem low, but a series of experimental heats was run off to determine the effect of bed height on the iron. Results showed that with uniform blast, coke splits and charges, the carbon content increased with increase in bed height. It also increased with increases in coke splits, providing the blast, bed and charges were held uniform. A 34-inch bed is low enough to prevent too great a carbon pick-up, and coupled with a 1¼-hour soaking period and proper blast volume, it is high enough to bring the iron down white hot from the start.

The amount of coke through which the molten iron drops is held to a minimum by setting the tuyeres as close to the sand bottom as possible. This, too, helps to prevent carbon absorption. The continuous tap works the same way. The iron is withdrawn from the cupola as fast as it melts, so that it does not lie in contact with the incandescent coke in the well of the cupola. Blast volume is held constant so that a uniform melting condition exists; a high blast makes for a lower carbon content, but this gain is more than offset by excessive loss in silicon and manganese.

At the start of this development, the blast volume was determined by the speed of the blower, with no means of measuring it exactly or of holding it uniform throughout a heat. As the heat progressed the pressure drop through the cupola gradually decreased; the blower picked up speed thus causing a gradual increase of blast. The blast would be approximately 5200 cubic feet per minute at the start and would increase to 5800 or 5900 cubic feet at the end. Carbon content decreased slowly through the heat.

Castings poured from these heats would show spongy spots under the risers. These defects resembled a combination shrink and gas cavity. Larger and higher risers were used, but still the spongy spots occurred. The molds were made in dry sand and the cores were open and well vented, so that the defects were chargeable directly to the iron.

Installation of the recording blast-volume meter brought with it a sure means of measuring and controlling the blast. As soon as the meter indicates an increase in blast volume, the motor is slowed down to the speed that will bring the volume back where it belongs.

Since inaugurating this practice there has not been the first sign of a defect under a riser. The defect, we believe, was caused by the presence of gas in the iron which was released when the iron set and gathered at the last place to freeze, directly under the riser. This absorption of gas by the iron was caused by a nonuniform melting condition.

Melts Close to Tuyeres

Toward the end of the heat the increased blast volume brought about an oxidizing condition, or a condition that would introduce gas into the metal. The logical conclusion seemed to be that the increase in blast would tend to raise the melting zone; but, acting to the contrary, it would burn away coke in charges above the melting zone so that the actual bed height was decreased instead of raised. Thus, the melting took place too close to the tuyeres.

Control of the blast volume has done away with this condition. There are no gas pockets anywhere in the castings now. Evidently the melting conditions were wrong and now are about correct. In the early stages of development trouble also occurred in getting iron hot enough and fluid enough to pour. At times iron would freeze on the lip of the crane ladle while pouring. Iron of this same analysis, melted with the

(*Concluded on page* 56)

Separate Melting

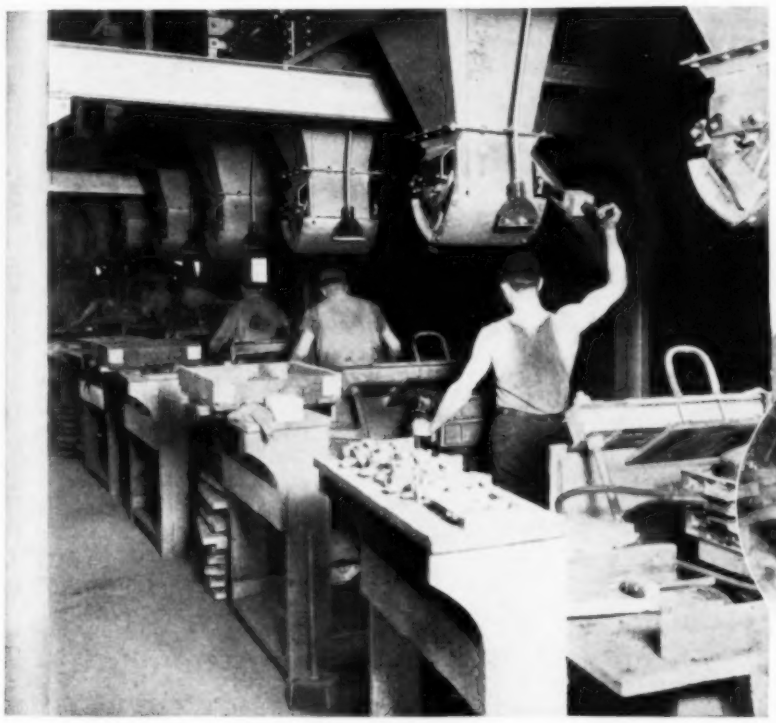
WHEN the paper from which this article is abstracted was presented at the Detroit meeting of the American Foundrymen's association, it aroused considerable discussion among those present. One member expressed astonishment at the low shrinkage obtained with such a low carbon, low silicon iron. Another compared a tensile strength of approximately 50,000 pounds obtained from a standard test bar taken from a 2-inch section of the casting, with a strength of 50,000 pounds in a regularly poured arbitration bar, and gave the name of super-high-strength to the authors iron. All were interested in the method and results obtained.

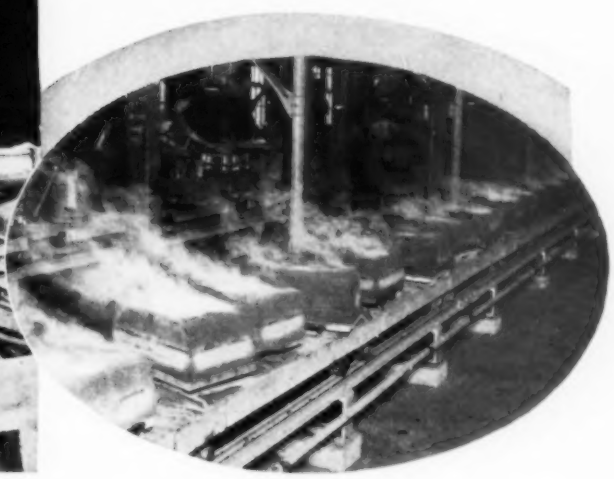
Mr. Judson is assistant foundry superintendent, Goulds Pumps, Inc.

FOUNDRY EQUIPMENT

ENGINEERED

FOR THE HIGHEST FOUNDRY EFFICIENCY





Lower Prices *Must* be Met With Lower Costs

After every lull in business, the big rewards in growth and profits go to those who have taken the opportunity to prepare for the approaching period of business activity.

Today, with casting prices at low levels, foundries should heed this lesson. Business increases will come . . . and profits will have to be made at these lower price levels. For the foundry that faces these facts, there can be but one conclusion . . . castings must be produced at lower costs.

The way to lower costs is not the same in every foundry. But there are certain operations, common to all foundries, where up-to-date methods mean sure savings.

Take material handling operations, for instance. Under old-fashioned, manual methods they are responsible for the major share of total foundry costs. Yet in this field, modern handling equipment, engineered by Bartlett & Snow, has proved itself capable of establishing materially lower costs in foundries of every type. Continuous mold conveyors, mechanical sand handling and conditioning equipment or simple conveyors for handling molds and castings . . . one or all of these may be the answer to your cost problem.

Decide now to learn what savings Bartlett & Snow equipment can show in *your* foundry. Write for information.

THE C. O. BARTLETT & SNOW COMPANY · 6201 Harvard Avenue, Cleveland, Ohio

For the Dominion of Canada
PEACOCK BROTHERS, LTD., MONTREAL

For Continental Europe
Société Anonyme des Acieries ci-devant Georges Fischer Schaffhouse, Switzerland.

BARTLETT-SNOW

For Great Britain
PNEULEC, LIMITED, SMETHWICK, NEAR BIRMINGHAM

(*Concluded from page* 54)

blast held uniform, now is sufficiently hot and fluid to meet all our needs. These experiences are mentioned because many foundrymen object to a low-carbon iron as setting too quickly and shrinking excessively. Our experience was quite similar until the melting conditions were corrected.

Present practice is to cast all jobs of new design in molds without feeding risers. All new designs of cylinders are molded with flow-off risers only, not large enough to feed. Regardless of the sections of the castings, varying from 1½ up to 4 inches no risers are used.

Castings have been broken up into small pieces and have shown no signs of internal shrinkage, open-grained metal or gas pockets. One particular job weighing 2500 pounds has a 1½-inch thick circular pipe section abutting on a section varying from 3 to 4½ inches thick and forming a sharp re-entrant angle, a condition which promotes shrinkage. No risers are used in pouring this casting, yet the castings are entirely sound and solid and are tested at 3500 pounds per square inch pressure and do not sweat. They operate under 900 pounds per square inch oil pressure, and even then show no signs of sweating.

This same kind of iron is poured into small green-sand jobs such as pump plungers, glands and levers. Standard gates are used. The iron is very hot, so that we experience no difficulty in getting these castings to run. No risers are used.

The iron seems to have almost as long a molten life as our other grades, although such was not the case before we hit upon the proper blast condition. Before, we had difficulty at times in pouring a 5-ton ladle of iron into three molds, without iron freezing on the lip. Now, we can hold the metal for 15 minutes before pouring and run into no difficulty with dull metal.

This is offered as proof that a low-carbon cast iron does not necessarily have a short molten life. We do not make it a practice to hold the metal in the ladle, because a finer grained structure is obtained by pouring hot.

The question we would like to have answered is this: What is there about this iron that makes it *nonshrinking*, insofar as shrinkage troubles in the foundry are concerned? Low-carbon cast irons are supposed to shrink excessively, a thought that we, like many others, had entertained. However, this particular iron does not act in that way and we have no explanation to offer as to why it does not.

We have advanced the thought that this might be an iron of an eutectic nature because it has a narrow freezing range. Evidently the range is so narrow that the volume decrease between the liquid and the solid state does not occur in one spot (as a shrinkhole), owing to lack of time, but is disseminated throughout the entire casting.

Accuracy Features Cylinder Cores

(*Concluded from page* 14)

By normally maintaining a sufficient quantity of iron for a day's use, it is possible to check and control the analysis closely. Samples of metal are taken frequently. In the control of the sand, checks are made every two hours or more frequently. Regular tests are made for green sand bond, for compaction and moisture, as well as grain size, due to the influence on permeability.

Castings are shaken out after a specified time has elapsed, when the gates and sprues are knocked off. The castings are carried by conveyor to the roof of the foundry where they are allowed to cool gradually to a temperature which permits handling. Castings then are cleaned by a high pressure shot blast and transferred to the foundry machine shop. They are machined, checked and inspected before being conveyed to the motor building where assembly of the engine begins. The weight of the casting in the rough is approximately 219 pounds, with a finished weight of about 187 pounds.

In addition to visual inspection of the castings, they are given a double water-pressure test. The first is given after milling off the faces and the rough boring of the cylinder barrels, and the second after the barrels have been honed and burnished. A 60-pound pressure with water at 180 degrees Fahr. is used. The hardness of the casting is checked by brinnel readings to see that the hardness of the cylinder bores is sufficient to withstand wear, and at the same time that portions of the castings of light section do not exceed a machinable hardness.

Foundrymen Hold Meeting at Pittsburgh

Prof. James Aston, Carnegie Institute of Technology, Pittsburgh, addressed the first regular meeting of the 1932-1933 year of the Pittsburgh Foundrymen's association at Carnegie Institute of Technology, Pittsburgh, Oct. 17. Professor Aston described the Aston process of producing wrought iron.

O. S. Kelly, formerly branch manager, C. O. Bartlett & Snow Co., Cincinnati, has been moved to the main office of that company in Cleveland.

Safety Council Announces New Officers

The following officers were elected at the twenty-first annual safety congress and exposition held recently in Washington by the National Safety council: President—J. I. Banash, Consulting Engineer, Chicago; vice-president for public safety—Robert I. Catlin, Aetna Life Insurance Co., Hartford, Conn.; vice-president for engineering—J. E. Culliney, Bethlehem Steel Co., Bethlehem, Pa.; vice-president for industrial safety—George H. Warfel, Union Pacific Railroad Co., Omaha, Nebr.; vice-president for membership—Howard B. Fonda, Burroughs Wellcome (U. S. A.) Inc., New York.; vice-president for local safety councils—John E. Long, supervisor of safety, Delaware & Hudson Railroad Corp., Albany, N. Y.; vice-president for business administration—G. T. Hellmuth, general claims attorney, Chicago, North Shore & Milwaukee Railroad Co., Chicago; vice president for Health—Dr. Cassius H. Watson, medical director, American Telephone & Telegraph Co., New York; vice president for education—Albert W. Whitney, associate general manager, National Bureau of Casualty & Surety Underwriters, New York; treasurer—Will Cooper, Stevens Hotel Co., Chicago; managing director and secretary—W. H. Cameron, Chicago.

A. S. T. M. Makes Specification Changes

Nine standards appearing in the *1930 Book of A. S. T. M. Standards* have been revised or discontinued and now are obsolete, due to action of the 1932 annual meeting of the American Society for Testing Materials. The revised standards appear in the 1932 *Supplement* of the book of A.S.T.M. standards, which recently has been published.

The standard specifications for bronze bearing metals in ingot form have been discontinued. That material is covered by the tentative specifications for copper-made alloys in ingot form for sand casting, which appear in Volume 32 of the *Proceedings*, Part I, 1932, and also in the 1932 book of tentative standards of the American Society for Testing Materials.

A large amount of machinery is used in farming in Western Canada. Recent figures show the following equipment in use: Tractors, 97.176; binders, 431,339; combines, 8925; cream separators, 431,277; gasoline engines, 155,655; and electric motors, 14,638. One farm in every six has a radio and one in every 3.11 a telephone.

The Foundry Through the Years

(*Concluded from page* 23)

castings increased from 192,803 tons in 1900 to 703,157 tons in 1907.

THE FOUNDRY contributed a full share toward the movement for better buildings which had its inception in the steadily rising wave of prosperity which characterized the years at the turn of the century.

Almost from the first issue of the magazine the editors had deplored the fact that the foundry departments almost without exception had been treated as step children in any group of buildings designed for manufacturing purposes. Again and again, attention was directed to the fact that the machine shop was the pet. Where an appropriation was made for plant improvement, the machine shop usually was allocated 75 per cent, the office 15 per cent, the pattern shop 10 per cent and the foundry either received no consideration or had to be content with a coat of whitewash.

New Era Brings Change

This has been changed to a great extent in the era commencing with 1900. Today the average foundry compares favorably with any other manufacturing unit. Illustrated descriptions of approximately 100 large, new foundries were presented in THE FOUNDRY in the period between 1899 and 1907.

Evidence of the wide circulation of THE FOUNDRY is seen in the Oct. 1903 issue which carried articles describing the new foundry of the Westinghouse Electric & Manufacturing Co., at Trafford City, Pa.; introduction of American foundry methods into a prominent German Foundry; and the work of a master molder in Australia.

About this time THE FOUNDRY began to devote more space to the nonferrous section of the industry. Contributions appeared from many pens including those of Charles Vickers and John Buchanan. Later, Mr. Vickers served as associate and nonferrous metallurgical editor. Mr. Buchanan became widely known through an extended series of articles which later were compiled and issued as a bound volume under the title *Practical Alloying*.

W. M. Carr and Arthur Simonson figured among the many contributors on steel foundry subjects. The former devoted his attention to features in connection with open-hearth steel while the latter dealt with practically every phase of the production of steel castings by the converter process.

Articles covering the training of apprentices, cost systems, application of molding machines and other mechanical devices occupied a great deal of space in THE FOUNDRY for 1903. Henry Hansen, associate editor for several years and one of the most widely known foundrymen in the country died July 8, 1903 and was eulogized in the August number of the magazine. He will be remembered particularly by older readers of THE FOUNDRY for his work in organizing the body known for several years as the Associated Foundry Foremen. Practically every large foundry center had a branch of this organization by 1907. While attending the conventions of the American Foundrymens association, the Associated Foundry Foremen constituted a sufficiently important group to hold several independent sessions.

A mild protest appeared occasionally against the rapidly growing adoption of chemical analysis and the employment of chemists in the foundry. These protests were signed by the few remaining no-surrender-boys and may be compared to the feeble little flickers that sometimes spring up during the embers after a great fire has collapsed in a heap of ashes.

Pioneering work of the American Foundrymens association ably seconded by publicity given through the pages of THE FOUNDRY has sold the analysis idea to all progressive foundrymen.

Use Steel in Cupola

At the Chicago convention of the American Foundrymens association in 1901 Major McDowell presented a paper on his method of mixing steel scrap with gray iron in the cupola charge with the object of improving the strength of the castings poured from the mixture.

Apparently this paper created quite an impression for in practically all the articles dealing with cupola practice which appeared from several succeeding years in THE FOUNDRY, steel scrap in varying proportions, was indicated as part of the charge.

THE FOUNDRY for October, 1907 presented a paper read a short time previously by David McLain before the Milwaukee foundrymen. The paper dealt with the author's experience in the use of steel scrap as a component of the cupola charge. Mr. McLain later taught thousands of foundrymen to produce this metal under the name *semisteel*. His activities constitute a distinct chapter in the annals of the foundry industry, but do not commence properly until after the close of the period—1899 to 1907—covered in this section of the series of articles captioned "Through the Years with the Foundry."

On Jan. 1, 1907 the late A. O. Backert became editor of THE FOUNDRY and the September issue of the same year appeared as a 9 x 12 inch page size with a correspondingly greater amount of literary material dealing with an industry which had expanded to such a great extent in the comparatively short period of seven years.

P. D.

Fixed Costs 2.2 Times Prewar Levels

(*Concluded from page* 16)

per cent.

In addition to the individual items of fixed costs, members co-operating in this study were asked to report labor costs and total costs of production on the basis of normal operations so that items of fixed costs could be related thereto. In 1924, which was about the peak of the rise, total costs were double those of 1914 and that since 1924 almost exactly one-half of the increase that took place during the war period has been eliminated. Labor costs show the same relative changes as do total costs—an increase of 100 per cent between 1914 and 1924, one-half of which since then has been deflated.

By deducting labor costs and the previously mentioned items of fixed costs from total costs, it can be determined to what extent the war period increase in other items of cost has been eliminated. It is apparent that items of cost, other than labor, over which the industry can exercise a degree of control are today down to the prewar level.

In summary, the salient points of the information collected and here presented indicate—

1. That fixed costs of freight, taxes, insurance, electric current and depreciation, or items over which the industry can exercise no direct control, are today 2.2 times what they were in 1914 and prewar years.

2. That one-half of the war period increase in labor costs has been deflated and that it would appear that no further appreciable decrease in labor costs could be anticipated.

3. That costs, other than labor and fixed items, or those over which the industry can exercise some control, are today deflated to a prewar level.

4. That, if and when the industry gets back in black figures, it unquestionably will have to be the result of an increase in the price of the commodity, rather than from the effect of any further appreciable cost reduction.

Lamson Co., Sracuse, N. Y., will distribute the overhead chain conveyor system manufactured by Jarvis B. Webb Co., Detroit.

Machines Feature Paris Display

(*Concluded from page* 27)

machine section, and in addition to the machines already mentioned, a Czech engineer, J. Polak, of Prague, showed a special squeezing machine. The Hartung Co., of Berlin, German, exhibited a combined jolting and squeezing machine. The top part of the machine is composed of a swinging arm, and it can handle flasks of considerable size. On the same stand were examples of the Hartung-Herman rollover machine.

Interest was shown in die-casting machines for nonferrous metals. One such machine was exhibited on the stand of J. Polak, Prague. Buhler Freres, Paris, showed two types of machines, one for relatively small castings, the other for larger pieces. The ladle is dipped into the bath of molten metal, and compressed air acts on the metal in the ladle through a small opening, which reduces the possibilities of oxidation. Heating the crucible in which the metal is melted is effected either by gas or by fuel oil, and a temperature up to 800 degrees Cent. can be obtained. The machine is hand-operated, and can give 200 operations per hour.

Casting Nonferrous Ingots

On the same stand was a special machine for casting ingots of the alloys of lead, tin, zinc, aluminum, and bronze. The crucibles containing two or three different metals to be mixed can be poured mechanically into one another, and the last crucible in which the metals are mixed can be poured mechanically into the ingot-making machine. It is claimed that this method reduces labor, and also reduces metal losses, while it provides clean and sound ingots. Etablissements Glaenzer et Perreaud, of Paris, also displayed a casting machine for bearing metals and light copper alloys. This machine can be operated by hand, or operated semi-automatically or automatically with the use of compressed air.

Etablissements A. Sisson-Lehmann, of Charleville, exhibited equipment for cleaning castings, and in particular a tunnel machine which enables castings of abnormal length to be cleaned. Such machines can be placed in a series, and the casting is driven on a roller or belt conveyor.

The stand of the Italian section grouped a number of statues and castings which gave full credit to the artistic characteristics of that country. There were also a number of large steel castings from the leading Italian firms, a selection of utility castings, and an example of electric control box designed by Ing. P. L. Tagliaferri. Sample of raw materials obtainable in Belgium, especially sands and irons, also examples of industrial castings and various types of foundry equipment, were shown on the Belgian stand, while the Spanish section also exhibited examples of castings made for the principal industries of the country.

Loam Mold For Large Steel Castings

(*Concluded from page* 21)

was built over the face of the core to form the casting thickness. A coating of thin loam was spread over the bricks and the face was swept to shape as shown in Fig. 2. After the loam had set, the loose pieces designed to serve as patterns for the lifting lugs *C*, Fig. 7, also the brackets at the neck immediately above, were adjusted in place. A horizontal space at the outside base of the mold then was prepared for the reception of the drawback plates.

Lengths of suitable rail sections were leveled in this bed to serve as part of the *iron to iron* connection through the mold. The general assembly of drawback plates as it would appear without bricks or sand, is shown in Fig. 3. The top girders formed a seat for the cope and a support for the weights designed to hold the cope in place when the mold was filled with liquid steel.

With all the drawback plates in position, old ingot molds were set up near the outside of each for pillars and also as weights to counterbalance the weight of the overhanging sand. Dividing boards were erected above the joints of each pair of plates to separate the entire body of sand into 8 sections. After the first course of sand was rammed, the holding down hooks were inserted in short staples of the drawback plates. The long rods were anchored horizontally to support the gaggers at various points in the overhanging sand.

Special collapsible patterns were constructed to form the feeding heads attached to the lower rim of the casting. A square interior part was drawn first, after which 4 side pieces fell in and easily were removed. The top of the opening was covered by a special core. Fireclay ingates and spruce were built up from four of the bulb sinkheads as shown in Fig. 7. The ingates entered alternate heads, just below the crown. The surface on the opposite side was heavily nailed to prevent erosion.

After reaching the required height on the drawbacks, a circular joint was formed with the strike or sweep *B*, Fig. 2. This type of joint eliminated the risk which would attach to the weak feather edge type of joint. The step joint also was formed as a dam to prevent any possible bursting out of metal during the casting operation. The top girders *A* Fig. 3 were the last items to go into place, and corresponded to the top flange of a drag flask in ordinary molding practice.

A large grid or arbor in 8 sections as shown in Fig. 4, and provided with long dabbers or prongs was lowered into place to support the body of sand over the top of the mold. Hook gaggers were suspended from the arbor and the arbor itself, in turn, was suspended from the bars of the cope by suitable hooks as shown in the sectional view Fig. 6. Four openings were left in the center of the assembled arbor for the accommodation of four large feeders or sinkheads shown in Fig. 7. Iron packing and wedges were inserted between the top of the arbor and the bottom edge of the cope bars before the hooks were drawn up tight.

The second and concluding article on this subject containing reference to dismantling, finishing, drying, reassembling of the mold, also the method adopted in pouring the metal will be taken up in an early future issue of THE FOUNDRY. In addition, this second article will cover the molding methods adopted in the production of one of the distance piece castings.

Detroit Founders Discuss Modern Methods

M. J. Gregory, factory manager, foundry division, Caterpillar Tractor Co., Peoria, Ill., spoke on the planning and operation of that foundry at the first regular meeting of the 1932-33 season of the Detroit Foundrymen's association, which was held in the Fort Shelby hotel, Detroit Oct. 20. Mr. Gregory also showed motion pictures illustrating the performance of the tractors made by the Caterpillar company in a variety of operations. A general discussion of modern methods of production and means of manufacturing special metal required to withstand stresses and strains of heavy duty performance brought out many practical ideas.

Fifty-five members were in attendance, including a large representation from the pattern industry.

Association of Manufacturers of Chilled Car Wheels will maintain an exhibit in the Travel and Transportation building at A Century of Progress exposition in Chicago in 1933.

CRUCIBLES

STOPPERS

Established in 1872. Sixty years of successful operation. This record is proof of the superior quality of our products.

Write or send us your next order.

McCULLOUGH-DALZELL CRUCIBLE CO.

Pittsburgh, Pa.

Just like an old time troubadour

The Adventures of Bill

BY PAT DWYER

WHEN I read some of the—well, to say the least, peculiar—decisions handed down in the law courts," Bill said, "I am moved to wonder if the country would not be the gainer by ditching the whole mass of laws on the statute books and starting off with a new deal. Apparently all the decisions are based on technicalities and precedents. The idea of dispensing justice never is given any consideration.

"What has aroused the old crusading spirit?" I inquired. "Why the sudden fire, the lance in rest, the war horse snuffing the battle afar off? Aha and so forth. Have you been in front of the beak for parking too long in front of a fire plug, or, was it a difference of opinion between a cop who brazenly claimed you were doing 50, and you, who knew you were just jogging along at 30. I know it is aggravating, but—"

"This has nothing to do with traffic laws, and for that matter has nothing to do with me. As the feller says it is just the principle of the thing. I don't know the man who figured in a short item in the paper recently but my indignation was aroused at the shabby treatment he was accorded when he appealed for justice. The reporter seemed to consider the story of a humorous character. Probably he is young and single.

"According to the newspaper story, a livery stable man's wife secured a divorce from him about 20 years ago and he was ordered to pay her alimony. At the time, business was pretty fair in the livery stable line and he paid. In the face of diminishing returns he continued to pay year after year, but recently the returns vanished altogether and he was left without an income of any kind. The vanished wife still hounded him for the monthly stipend something to remember him by!

"Under similar conditions the average man would tell her to take a long running jump in the lake, but this honest lad decided to have everything ship shape and according to the rules and regulations. With hat in hand he appeared before the beak—the honorable court to you—and modestly set forth his case. He made affidavit that he was on his uppers, absolutely without income of any kind and humbly petitioned that the court lift the embargo or whatever it is, relieve him of the obligation and in a word notify his ex-wife that the golden goose had ceased laying.

"The honorable court listened to the tale of woe with marked courtesy and sympathy. He was quite aware of the fact that the livery stable business had gone the way of hoop skirts, whale oil lamps and the long Kentucky rifle. Nevertheless and notwithstanding, the decree had been entered on the records and the payments would have to continue.

"Naturally, the victim expostulated. How in the name of all the king's horses and all the king's men could he pay, when he had nothing, and no prospect of anything?

"He was informed that these factors are not relevant to the point at issue. The court was not interested in his present or future status or in how he raised the money. That was a problem for the petitioner to solve. The law was the law. Dismissed. Next case."

He never cares to ramble from his own fireside

"I see nothing in that," I said, "to cause you to rear up on your hind legs, champ at the bit and scatter froth all over your chest. If the man has no money he cannot pay alimony, law or no law. So far as I can see he is as safe as if the court had absolved him from all further obligation. I may be wrong, but it seems to me that the party of the second part, the lady who kicked over the traces, is the one who is going to be stuck, like the cat in the tar barrel."

"Serve her right," Bill declared vigorously. "In recent years this alimony racket has developed to a point where it bids fair to rank with the three great scourges of mankind, war, pestilence and famine. The basic idea is sound. Where a man puts away his wife without just cause, where a wife takes it on the lam justifiably, or where there are minor children, the man certainly should pay for their maintenance. The economic position of women has changed radically during the past few decades, but the law courts still base their decisions on precedents established when women were little better than vassals and men were the supreme lords of creation.

"Women now enjoy all the rights and privileges of men, but are singularly free from nearly all their obligations. For example, did you know that a woman irrespective of her wealth, is under no legal obligation to support her husband or even her children? A man must pay any debts contracted by his wife, but a woman can snap her fingers at any person who asks her to pay for debts contracted by her husband.

"If a man neglects or refuses to support a wife, the mighty engine of the law readily and easily is set in motion to compel him. The same man, cut off from all sources of revenue, can whistle until he is black in the face if he tries to collect

maintenance from his wife through legal channels. This despite the fact that her bank account may have been conferred upon her by her husband during his period of affluence.

"Certainly she may share with him voluntarily or she may dole out enough to make him realize his insignificance, but if she refuses flatly to contribute a penny toward his support, not a court in the land will come to his assistance. The feminine motto always has been 'What's your's is mine and what's mine is my own.' The law, in its chivalric and patriarchial senility, gallantly upholds this contention.

"Considering your views in the abstract," I admitted, "I am inclined to agree with you. Methods of dispensing justice have not kept pace with the social, economic and industrial developments of the past 30 or 40 years, a period of changes probably without parellel in history.

"However, coming down to a concrete case, and that based merely on a short item in a newspaper, don't you think you should seek further particulars before taking up the cudgels so valiantly for the man in the case? For all you know to the contrary his wife had to leave him to retain her self respect, or, perhaps he was one of these here now dirty dogs who ketch 'em young, treat 'em rough and tell 'em nothing. In either event she was entitled to all the alimony she could get and you are wasting your sympathy on one who is not entitled to it."

"All the evidence I need is contained in the statement that the man conducted a livery stable and continued to operate it for he past 20 years on a steadily reducing scale until finally the business just naturally disappeared like water poured down a rat hole. That man had an instinctive love for horses. Men of that kind do not beat their wives or throw their children down deep wells.

"Had he been of a mercenary disposition, a disposition usually at the base of all the other vices, he would have quit the livery stable business many years ago when the automobile began to crowd the trotters and pacers from the highways and byways. Any person endowed with even ordinary intelligence could foresee years ago, the extinction of the livery stable, particularly in the larger cities.

"So far as I know, no person ever accused a livery stable man with lack of intelligence. On the contrary, the very nature of their business sharpened what native intelligence they possessed originally, to a high state of perfection. This man despite his better judgment, actuated solely by a species of affection readily apparent to nearly all who have had any dealing with horses, stayed by his business until economic conditions whisked the business from under his feet and left him destitute and penniless.

"That is all the recommendation I need. You can't tell me this man was the villain in the case. I still stick to my opinion that he was the victim from first to last. First he loses his wife, then he loses his horses and then he loses his case in court. Hard luck, I calls it."

"Who was the author of that famous quotation," I asked. " 'Four things greater than all things are, women and horses and power and war?' "

"I don't know who he was, but he certainly said a mouthful. I shall be glad to go into that subject a little deeper some other time. In the meantime your reference to a quotation reminds me of a letter I had recently from a foundryman. He had been asked to recommend a suitable analysis for a retort casting which has a wall thickness of 1½ inches and which is subject to a temperature of 1600 degrees Fahr. in service. He was familiar with the analyses of two similar castings and submitted them for my opinion. The first casting had been in use for 4½ years. The second casting burned out in less than 3 years. The analyses follows:

	No. 1 Per cent	No. 2 Per cent
Silicon	1.36	2.88
Sulphur	0.09	0.12
Manganese	0.40	0.20
Phosphorus	1.07	0.80
Combined carbon	2.09	1.87
Graphite carbon	1.37	2.08

"In his opinion No. 2 casting was made from a stove plate scrap mixture which accounts for the relatively high silicon, phosphorus, sulphur and graphitic carbon content. The grain of this iron would be fine and close when cast into a thin stove plate section, but would be open and coarse when poured into a section 1½ inches thick.

"He suggested the following analysis: Silicon 1.30 per cent, sulphur 0.09 per cent, phosphorus 0.20 per cent, manganese 0.75 per cent and total carbon as low as possible. He also suggested the addition of 30 to 40 per cent steel in the mixture.

"Foundrymen who have made castings designed for a purpose where they are subjected to continuous or intermittent high temperature, know that the iron from which the castings are made must be low in silicon, sulphur and phosphorus. Iron of this character usually is low in total carbon and therefore the relative proportions of combined and graphitic carbon is not a factor of major importance.

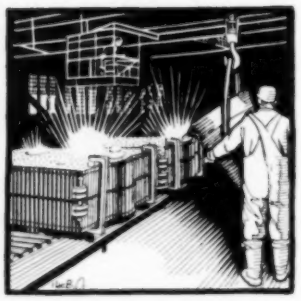
"The proportions of the two forms of carbon will depend on the mass or metal thickness in the casting. In a thin casting the proportion of combined carbon will be higher than in a casting where the wall is comparatively thick, even where the two castings are poured from the same ladle.

"Silicon really is the deciding element in closing the grain. Where iron shows a silicon content that will yield a fine close grain in a specified thickness of metal, the other elements usually will be found to be satisfactory.

"The analysis he suggested should insure a satisfactory casting for the severe service outlined, but I should hesitate to guarantee an anticipated life for the casting in excess of the casting designated as No. 1. With all due deference to the customer, I think that any casting which has withstood such grueling punishment for 4½ years has done all that reasonably could be expected.

The horse (in the center) probably will kiss him before he leaves

New Equipment



For Foundries

Maintains Record Of Machine Operation

An instrument which gives a machine operator a visible record throughout the day of idle time in minutes accumulated during his run; of productive time; and a count of the units produced, recently has been introduced by the National Acme Co., Cleveland. The instrument, which is known as a chronolog, will be marketed by the Graybar Electric Co.

In addition to keeping the operator constantly informed, the device, which is shown in the accompanying illustration, presents a detailed record to the foreman or superintendent. This record reveals precisely when an interruption occurred, why it occurred and how long it delayed normal production. The unit also produces any desired number of cards on which are summarized the total idle time, total productive time and units produced. These may be routed to timekeepers, time study and production departments.

The unit is energized by the ordinary lighting circuit and can be applied quickly. Whenever the machine or equipment is shut down for any cause, the operator registers that cause by dialing the symbol letter corresponding with the reason for shut down indicated on the symbol chart attached to the device. At the same time, a red signal light goes on

The operator is informed constantly of idle time

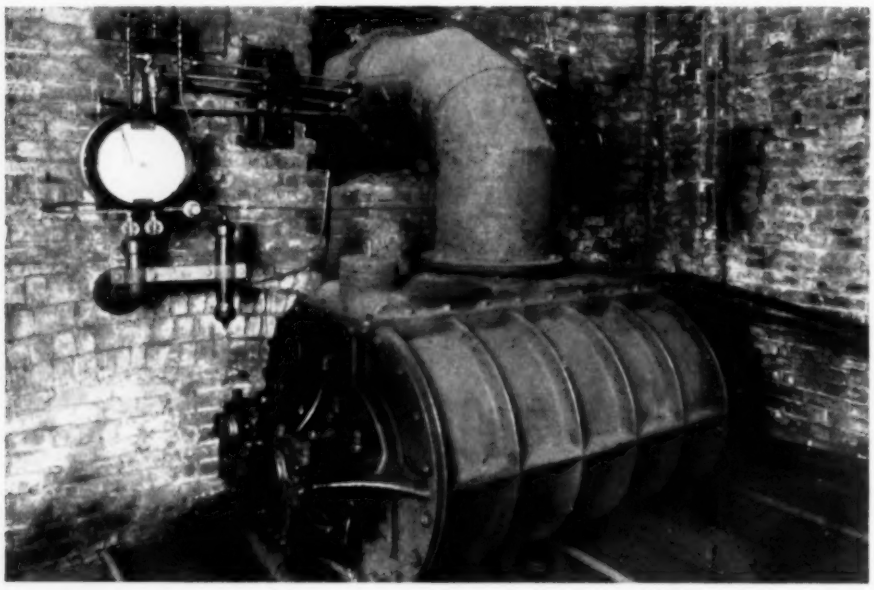
to let the foreman or other supervisor know that the machine or equipment is not producing, so that immediate steps may be taken to correct the difficulty. The machine records the gradually accumulating toll of idle time until normal production is resumed, when it automatically stops counting idle time and resumes the count of productive minutes and units produced.

The card produced by the machine also indicates to the minute the time the operator actually starts and stops his work and the arrival and departure of foreman, supervisor, inspector, machine repair man, stock man or electrician, thus recording the activity of those who have a definite influence on the output of the equipment, but who are not under the operator's control.

Controls Weight Of Air Entering Cupola

A new instrument that controls automatically the weight of air delivered to a cupola has been developed by the Foxboro Co., Foxboro, Mass. The air weight controller, which is shown in the accompanying illustration, is designed for use with practically any type of blowing equipment. When used to control air flow to a cupola, an orifice plate or other primary device is installed directly in the blast pipe. The instrument operates a controlled valve that automatically maintains delivery of the desired weight of air.

An interesting feature of the controller is the temperature and pressure compensating mechanism which permits the pen to record the weight of air or, if desired, the volume in standard cubic feet. Connecting lines from the primary device in the blast pipe provide a continuous flow of air through the air-tight case thus permitting the compensating mechanism to be under actual line pressure and temperature conditions. The importance of this device will be appreciated when it is considered that normal variations in atmospheric temperature and pressure cause the weight of oxygen contained in a cubic foot of air to vary as much as 20 per cent.

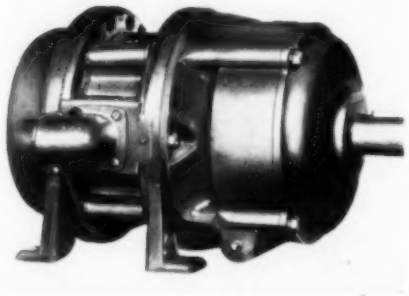


Cupola air weight controller installed in a New England Foundry

A. M. Barrett, for many years prominent in the materials handling industry, has been placed in control of the Barrett-Cravens Co., manufacturer of lift-trucks, skids, portable elevators, etc. The company will move into its own plant at 3255 West 30th street, Chicago.

Speed Reducer Is Triple Reduction Unit

A line of gear-motors, adaptable to machinery of a wide variety of designs, has been developed by the General Electric Co. Schenectady, N. Y. The underlying principle of



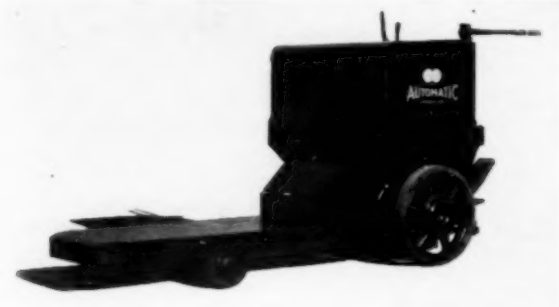
Speed reducer is built with motor

the units consists of a normal speed motor in combination with a built-in, internal-helical planetary-gear speed-reducer. Compact construction, high efficiency, full horse-power rating of the motor at the output shaft, economy of installation and operation because of the self-contained unit, and simple design are features claimed for the units which are available in either flanged or vertical mountings.

General Electric Co. also has developed gear-motors with special electrical characteristics, such as high starting torque with low starting current, normal starting torque with low starting current, adjustable, varying speed, multispeed, etc., or mechanical features such as totally enclosed and fan-cooled.

Electric Trucks Handle Skid Platforms

A 4000-pound capacity low lift truck, designed to supplement hand equipment and to be used for handling skid platforms, recently has been added to the line of material handling equipment manufactured by the Automatic Transportation Co. Inc., 101 West Eighty-seventh street, Chicago. The new model has been designed with an ample factor of safety to care for overloads to which equipment of that type frequently is subjected.



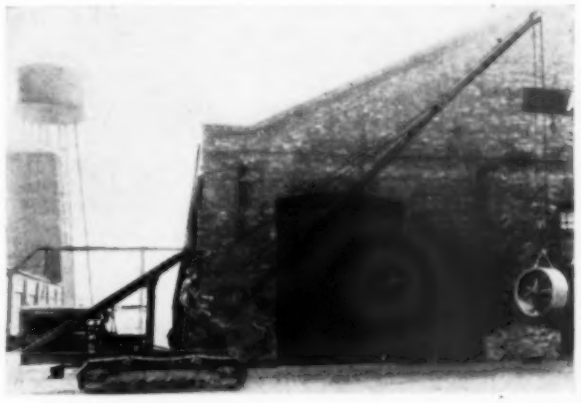
The truck has a capacity for 4000 pounds. Safety features include the interlocking foot controller

The spur gear drive is used and large drive wheels are provided making the truck from 10 to 15 per cent faster than previous models of the same capacity manufactured by that company. The truck also has been designed to maneuver in exceptionally small space. These features, it is claimed, make the truck particularly adaptable for congested industrial plants, warehouse and other applications.

The unit is so designed that the platform dimensions may be modified in such a manner that the truck can be used with skids of practically any length, width or height. Safety features include the use of the safety interlocking foot controller.

Unit May Be Used As Either Shovel or Crane

Austin Machinery Co., Chicago, recently has developed a new $\frac{3}{8}$-yard shovel and crane, as shown in the accompanying illustration. The main frame of the unit is of heavy H beams tied across with channels at the end and two heavy H beam axles underneath. The base casting for the turn table is one piece and contains the annular swing gear, radial trunnion track, gear box and center pivot post.



When used as a crane, the unit will handle loads of 3000 pounds on a 15-foot radius

Particular attention has been given in design to flexibility in operation. The crawlers are 10 feet 6 inches in length and 7 feet 8 inches from outside to outside in width, thus providing a substantial base. Each crawler may be controlled independently by the operator. Speeds as high as 4 miles an hour are possible, although the machine crawlers are not designed for transport over long distance.

The unit may be used with a clam shell attachment with a 25-foot boom and a bucket having a capacity of $\frac{3}{8}$-yard digging and $\frac{1}{2}$-yard rehandling; with a 48-inch back filler for scraping earth, or as a crane handling loads of approximately 3000 pounds at a radius of 15 feet.

Applies Grease To All Parts of Machine

Hills-McCanna Co., 2349 Nelson street, Chicago has developed a single line system for the mechanical application of light greases and heavy oils to points requiring regular lubrication. The main unit is located conveniently in a single feeder line taken to the farthest point requiring lubrication. Branch lines are taken from the main line to each bearing. No return line is required.

An independent mechanical measuring unit is placed at each bearing which allows only a predetermined amount of grease to be fed to the bearing and then acts as a shut-off valve, preventing any lubrication from being wasted. Regardless of the amount of pressure in the line only the amount for which the valve is set can pass to the bearing. The systems can be motor driven, mechanically operated, or operated by a hand crank.

Earl Steward, formerly associated with Albert Pack Corp., Chicago, has been appointed western district manager for the Molybdenum Corp. of America, with headquarters in the First National Bank building, Chicago.

Lift Truck Has New Type Release

Lewis-Shepard Co., Boston, recently has introduced a new hand lift truck having capacities up to 5000 pounds. The truck is made in two widths, 17½ inches and 24 inches and with lifts of

The truck has a capacity of 5000 pounds

1⅜ inches or 2¼ inches. It is pointed out that the truck lowers the loads forward and downward at the same time and that the descending load cannot grind down along the next load behind. A slight backward roll of the truck as the load descends prevents loss of floor space.

When in the load-raising position, the handle always is connected to the load. Therefore, the operator cannot pull on an empty handle with a resulting accident. To release the load from its elevated position, the operator presses lightly on the release pedal. A new type of horizontal release with a large reservoir has been developed for use on the truck.

Catches Dirt at Top of the Cupola

Entwisle & Gass, Ltd., Nelson street, Bolton, England, recently has introduced a cupola dirt catcher which operates on the principle shown in the accompanying illustration. In constructing the dirt catcher the cupola is cut off about one foot above the charging door and a chamber is carried to a point clear of the surrounding roof. The chamber has an increased area over the cupola and provides air spaces around the cupola proper, as shown in the illustration. The chamber is not lined with bricks and it is claimed the metal only becomes warm.

When the cupola is in operation, the hot discharge, as it issues from the short cupola, induces an upper current of air into the chamber, which cools down the cupola discharge and slows it down in speed. The grit and sparks, owing to the reduced velocity of the gases in the upper chamber, begin to settle before they reach the top of the chamber and deposit themselves on the platform surrounding the cupola. It is claimed that this action results in only a small amount of the finest grit being carried into the atmosphere.

In operation, it was found that a cupola 2-feet inside diameter with

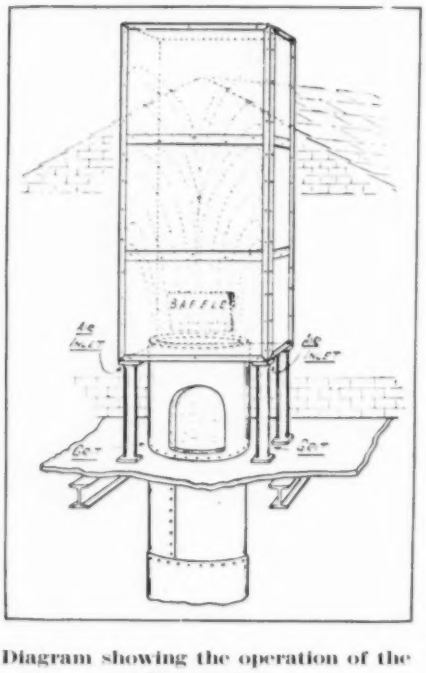
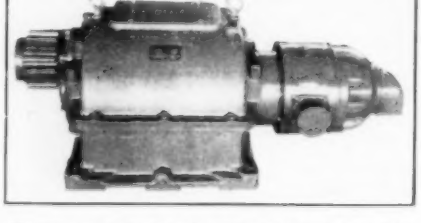


Diagram showing the operation of the dirt catcher

a 1-ton melt provided a deposit of 45 pounds of grit. Eighty pounds was collected in a cupola 2 feet 6 inches diameter with a 3-ton melt and about 100 pounds was secured in a 3-foot inside diameter cupola with a 5-ton melt.

Speed Reducer Is Triple Reduction Unit

A new motorized speed reducer recently has been added to the line of enclosed speed reducing units built by Link-Belt Co., Philadelphia. The reducer, shown in the accompanying illustration, is a triple reduction unit with a speed ratio of 312.2 to 1. The motor shaft, which extends into the reducer housing, operates at 1165 revolutions per minute and the low speed shaft at 3.75 revolutions per minute. Roller bearings and continuous-tooth herringbone gears are used. Advantages claimed for the motor with extended shaft and the mounting used are increased efficiency and compactness, reduction in floor space and elimination of high-speed motor-shaft coupling.

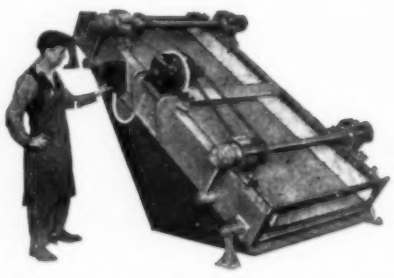


The motor shaft extends into the reducer housing

Vibratory Screen Is Made in Two Sizes

Stedman's Foundry & Machine Works, Aurora, Ind., has introduced a line of vibrating screens supplied complete with a ball bearing motor and roller chain drive enclosed in a dust-tight, oil-tight casing. Pushbutton control for the motor is mounted on the side of the screen frame.

Vibration is transferred to the screen tray which supports and carries the vibration to the wire cloth



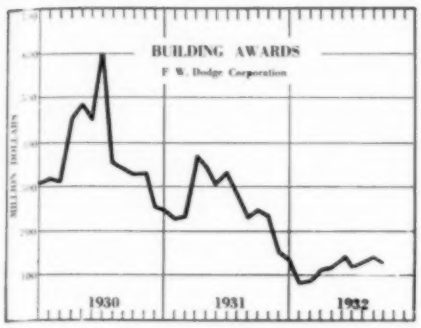
Vibration is transferred through four connecting rods

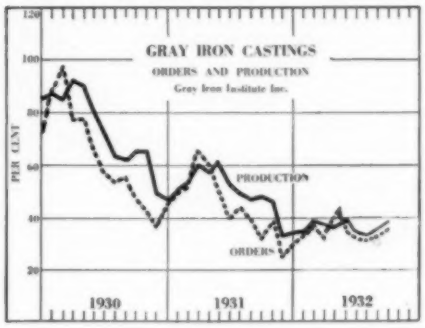
through four connecting rods, one end of each connecting rod being attached to either end of two revolving shafts which have ball bearing eccentrics. The other end of the connecting rod is attached to the shafts which support the screen tray. No springs are employed. The arrangement permits a large number of intensive vibrations—2600 each minute—with an unusually slow operating speed.

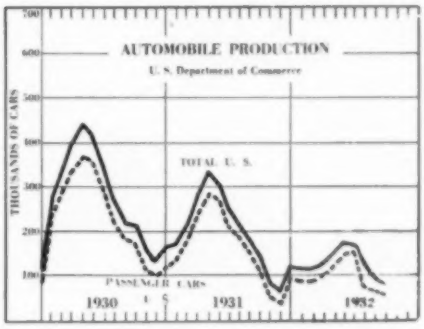
Two sizes are offered; one is 4 feet wide and 6 feet long, and the other 4 feet wide and 8 feet long. These screens are practical for handling large capacities and screening either fine or coarse. One of the units is shown in the accompanying illustration.

Aluminum Fluxes

Two new aluminum fluxes, one for welding pure aluminum and the second for welding aluminum alloys, have been developed by the Linde Air Products Co., 30 E. 42nd street, New York.







Foundry Activities

Reflect Industrial Trends

AGRICOLA Furnace Co., Gadsden, Ala., is running full time. Orders recently have been coming in at an encouraging rate and the prospect is good for continued production during the winter months.

* * *

Chevrolet Motor Co., foundry at Saginaw, Mich., resumed operations on Oct. 10.

* * *

Centralia Iron Works, Centralia, Wash., has resumed operations after being idle several months.

* * *

Hetzler Foundries, Rochester, N. Y., has been incorporated to operate a foundry by D. F. Fitzgerald, Rochester.

* * *

American Radiator Co., Bayonne, N. J., has started its foundry on full time after six months idleness, returning 900 men to work.

* * *

Baker Machine & Plating Co. Inc., 330 Bryan street, Fort Worth, Tex., manufacturer of nonferrous castings, reports business good.

* * *

Foundry of the R. O. Collins Iron Works, Tallahassee, Fla., recently was damaged severely by fire, with loss of about $7000.

* * *

Thew Shovel Co., Lorain, O., T. R. Miller, secretary-treasurer, has increased operations 65 per cent to meet increased orders.

* * *

Eaton-Erb Foundry Co., Vassar, Mich., is installing a new heating plant which includes a boiler house, boiler and about 15,000 feet of unit heater radiation. The boiler will be fired with an oil burner which will use the heavy oil employed in the annealing furnaces and core ovens.

* * *

Fort Worth Well Machinery & Supply Co., 1707 Main street, Fort Worth, Tex., has purchased the California Meter Co., Los Angeles, and will move the plant to Fort Worth.

* * *

Glauber Brass Mfg. Co. Inc., Cleveland, has been incorporated by Orlo L. and Fred D. Prior to take over the company of the same name at 7706 Platt street. The company produces plumbers' brass goods, etc.

* * *

S. & W. Casting Co., Newark, N. J., recently organized, has leased a building at 62 Ferguson street to manufacture brass, bronze and aluminum castings.

* * *

Reliance Foundry Co., 1933 Macomb street, Detroit, has been incorporated to operate a foundry, by Otto H. Sauer, 5735 Rohns avenue, Detroit.

* * *

Pangborn Corp., Hagerstown, Md., has let a contract to Rust Engineering Co., Koppers building, Pittsburgh, for an addition to its pattern storage building.

* * *

Triumph Metallic Products Corp., Philadelphia, has been incorporated to establish and operate a foundry, by Herman H. Yaffe, 2241 North Front street.

* * *

International Aluminum Foundry Co., New York, has been incorporated to take over a foundry by that name by E. Loebel, 251 Fifth avenue.

* * *

Lebanon Steel Foundry, Lebanon, Pa., has taken a license from the Carpenter Steel Co. to manufacture antifriction, corrosion-resisting steel under the patents of the latter.

* * *

Montag Stove & Furnace Works, Portland, Oreg., has added the manufacture of air conditioning equipment to its line of heaters and furnaces.

* * *

September business of the Milwaukee Die Casting Co., 1015 North

RAW MATERIAL PRICES

Nov. 7, 1932

Iron	
No. 2 foundry, Valley	$14.50
No. 2 Southern, Birmingham	11.00
No. 2 foundry, Chicago	15.50
No. 2 foundry, Buffalo	16.00
Basic, Buffalo	15.50 to 16.00
Basic, Valley	14.00
Malleable, Chicago	15.50
Malleable, Buffalo	16.50
Coke	
Connellsville beehive coke	$2.75 to 4.25
Wise county beehive coke	4.25 to 5.00
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$8.25 to 8.75
Heavy melting steel, Pitts.	9.00 to 9.50
Heavy melting steel, Chicago	5.75 to 6.00
Stove plate, Buffalo	7.75 to 8.00
Stove plate, Chicago	5.75 to 6.25
No. 1 cast, New York	6.00 to 6.50
No. 1 cast, Chicago	6.00 to 6.50
No. 1 cast, Pittsburgh	9.50 to 10.00
No. 1 cast, Philadelphia	9.00 to 10.00
No. 1 cast, Birmingham	9.00 to 9.50
Car wheels, iron, Pittsburgh	8.50 to 9.00
Car wheels, iron, Chicago	7.00 to 7.50
Railroad malleable, Chicago	6.00 to 6.50
Agricultural mal., Chicago	5.00 to 5.50
Malleable, Buffalo	8.00 to 8.50
Nonferrous Metals	
	Cents per pound
Casting copper, refinery	5.00 to 6.00
Straits tin	23.05
Aluminum, No. 12, producers	22.00
Aluminum, No. 12 remelt	8.00 to 9.00
Lead, New York	3.00
Antimony, New York	5.87½
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3.00

Fourth street, Milwaukee, increased 50 per cent over August and October held up well to the September level, with business equal to that of a year ago. Inquiries indicate prospects are good, especially with expected seasonal improvement in automobile manufacture of new models.

* * *

Worthington Pump & Machinery Corp., Buffalo, has given contract to H. K. Ferguson Co., Hanna building, Cleveland, for a 2-story pattern storage building 100 x 100 feet.

* * *

American Brake Shoe & Foundry Co., has bought five acres near Linden avenue, South San Francisco, Calif., and plans construction of a plant next year, to cost about $50,000.

* * *

C. H. Eib, president of the Pettibone-Mulliken Co., Chicago, manufacturer of railway track material, castings and forgings, has been appointed receiver in equity for the company on petition of a creditor.

* * *

Smiths Falls Castings Co., Smiths Falls, Ont., has been organized to take over, reopen and operate the plant of the Smiths Falls Malleable Castings Ltd., idle for some time. Some new equipment will be needed.

* * *

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has purchased the business of the C. G. Buchanan Co., New York, manufacturer of crushing and concentrating machinery.

* * *

Anderson Stove Co., Anderson, Ind., has given a substantial contract for stove castings to the Anderson Engine & Foundry Co., its own foundry being unable to meet demands of present sales.

* * *

Weil-McLain Co., Michigan City, Ind., has placed between 100 and 125 men at work temporarily to fill seasonal orders for its line of boilers. Length of time the plant will operate has not been announced.

* * *

Wehrle Co., Newark, O., has resumed operations at its north plant, which has been idle about 3½ years. Stove accessories are produced at this plant, including nuts and bolts, oven thermometers and minor parts. A foundry is operated.

* * *

Taylor & Boggis Foundry Co., Cleveland, I. T. Kahn, president, has moved to the former plant of the Cleveland Brass & Copper Mill Co., Babbitt road and the Nickel Plate railroad. For 50 years the foundry has been on East Fifty-fifth street.

* * *

Lombard Iron Works & Supply Co., Augusta, Ga., has started production on a new line of hydraulic machinery including power pumps, centrifugal pumps, and automatic electric water systems for rural use. H. A. Thorndike is sales manager.

* * *

Anticiron Co. Inc., Wellsville, N. Y., recently incorporated to manufacture iron castings, has leased the Ward foundry building and will start operations as soon as the plant can be prepared. C. D. Campbell is president.

* * *

Buffalo Pipe & Foundry Co., Buffalo, has purchased a plant at Kenmore, a Buffalo suburb, and will occupy it in the near future. Increased production of cast iron pipe is planned, the new plant giving enlarged facilities.

* * *

Foundry operators in La Crosse, Wis., held an educational exhibit in the foyer of the Rivoli theater from Sept. 21 to Oct. 3. The exhibits were prepared by the Automotive Foundry, L. C. Hirschheimer, Iron Products Corp., O. J. Lunde, John Torrance and Son, and the Trane Co.

* * *

Aluminum Industries Inc., Cincinnati, is moving its motor parts division from St. Cloud, Minn., as noted in the September issue, to the former plant of the C. R. Breuer Smelting & Refining Co., Beekman street, Fairmount, which has been leased for 5 years.

* * *

Essco Mfg. Co., 111 Harrison street, Peoria, Ill., has been incorporated to operate a foundry and machine shop, by Loren M. Comber, Edward Kett and William Krieger. Todd, Morgan, Pendarvis & Arber, Central National Bank building, Peoria, are correspondents.

* * *

Sherod S. Noe, Mt. Pleasant, Mich., and John F. Burkhardt, Detroit, have bought the plant formerly occupied by the Duplex Machine & Tool Co., and will condition and equip it for the manufacture of oil heaters for domestic and commercial use. Foundry and machine shop will be equipped.

* * *

Charles Parker Co., Meriden, and the Artistic Bronze Co. have consolidated under the name of the former company. The plant will be located at Meriden. William W. Wrigth, president of the Artistic company, becomes vice president and a director of the Parker company. The Parker company manufactures hardware specialties and the Parker gun. The Artistic company makes art lamps, building hardware, etc.

New Trade Publications

SEALING SOLUTION—A four page bulletin describing its sealing solution for porous castings recently has been published by the Bakelite Corp., 247 Park avenue, New York. In addition to describing the action of the material, the bulletin also includes instructions for use.

INDUCTION MOTORS — Fully enclosed, induction motors are discussed in bulletin 112 recently published by the Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland.

FITTINGS—The Parker Appliance Co., Cleveland, has published a bulletin in which the characteristics of its line of copper plumbing fittings is discussed.

ENGINEERING SERVICE—A bulletin by Edwin S. Carman, Inc., 1643 Lee road, Cleveland, outlines the type of work handled by that company, using as an illustration several problems recently solved.

STOKER — Combustion Engineering Corp., 200 Madison avenue, New York, describes and illustrates a stoker unit equipped with dump grates in a recent bulletin. Data are presented on principal dimensions and sizes.

OIL BURNERS—Enterprise Oil Burner Co., San Francisco, Calif., has published a bulletin describing and illustrating three types of oil burners, one for cheap fuel oil, the second for lighter oil, and a third for heavy oil.

CENTRIFUGALLY CAST ALLOYS—Information on bronzes and other alloys centrifugally cast is contained in a bulletin recently issued by the Shenango-Penn Mold Co., Dover, O. Information on stock sizes for immediate shipment also is presented.

REDUCERS—Integral, flexible and all-motor types of motoreducers are discussed and illustrated in Bulletin No. 260 recently published by the Falk Corp., Milwaukee. Special features of design and instructions on how to select motoreducers also are discussed.

IRON—Electric furnace iron, known as Belectric, is discussed in a booklet recently issued by the Belle City Malleable Iron Co., Racine, Wis. Information is presented on the structure of the iron and the physical properties of the four grades produced are presented.

PUMPS—A pumping unit with a built-in electric motor and which has a dustproof ball bearing construction, is illustrated and described in a recent bulletin of Ingersoll-Rand, 11 Broadway, New York. Illustrations showing applications of the pump are included.

CONTINUOUS FURNACES — W. S. Rockwell Co., 50 Church street, New York, has published bulletin No. 340 listing the advantages of continuous furnaces for bright annealing, bright silver soldering and bright copper brazing.

BRONZE ALLOY — The Shenango-Penn Mold Co., Dover, O., has published the second edition of loose-leaf sheets designed to present information regarding centrifugal cast alloys. Information given includes a table of melting points and weights of metals,

a table giving bearing pressures for various classes of bearings, and various characteristics and uses of several alloys manufactured by the company.

MOTORS—A general-purpose squirrel-cage, induction motor in various forms is described in bulletin 1628 recently issued by the General Electric Co., Schenectady, N. Y. A flash-proof motor of the squirrel-cage, induction type is described in bulletin No. 1619.

CONDENSER—Pennsylvania Pump & Compressor Co., Easton, Pa., has issued a bulletin on jet condensers and auxiliaries for vacuum processes. The condenser described effects condensation of steam by direct contact of steam with cold circulating water.

VALVES—Duriron Co. Inc., Dayton, O., has published bulletin No. 514 devoted to valves and fittings of alloy steel. Information includes details of various types of valves, physical and chemical data on corrosion-resisting alloy steel, and brief information on machining, welding and heat treatment.

TRUCKS — The complete line of trucks and tractors manufactured by the Clark Tructractor Co., Battle Creek, Mich., is illustrated and described briefly in a 48-page booklet recently published by that company. A portable, flexible conveyor for transporting bagged goods also is described.

STAINLESS STEEL—Electro Metallurgical Co., Carbide and Carbon building, 30 East 42nd Street, New York, has published a bulletin entitled "Stainless Steel in the Brewing Industry" in which the application of austenitic stainless steel in one of the oldest industries is discussed.

BRONZE—Herculoy, a new engineering bronze recently developed by the Revere Copper & Brass Inc., New York, is described in a booklet recently published by that company. Information includes physical properties of the metal for sand casting, as well as for other products.

CIRCUIT BREAKERS—Roller-Smith Co., 233 Broadway, New York, has published its catalog No. 5 discussing standard, industrial and enclosed type of air circuit breakers for direct and alternating currents. Considerable technical data on the various types of breakers and attachments are included.

STEEL CHAINS—An illustrated 44-page catalog on steel chains has been published by the Link-Belt Co., 910 South Michigan avenue, Chicago. In this bulletin, information on older chains is brought up-to-date and many new sizes are offered for the first time. The sizes range from the small detachable steel chain having an ultimate strength of 950 pounds to powerful chains with strength as high as 1,500,000 pounds. Many attachment links are illustrated for elevating and conveying work and a line of sprocket wheels has been included.

TORCHES—Information of interest to those requiring equipment for soldering, brazing and heating is included in a bulletin recently prepared by the Linde Air Products Co., New York, and dealing with torches. The equipment operates on dissolved acetylene gas, which is available in tanks containing 70, 40, 30 or 10 cubic feet.

FLOOR STEEL—Acme Steel Co., 2940 Archer avenue, Chicago, has published a bulletin illustrating and describing floor steel, which is imbedded flush with the top in concrete and mastic floors, to bear the weight, absorb shocks and provide a nonskid surface. Methods of resurfacing worn out floors are described.

BLOWERS AND COMPRESSORS—Roots-Connersville-Wilbraham, Connersville, Ind., recently has issued bulletin 170-B10 on centrifugal blowers and compressors, designed primarily for oil and gas furnaces, gas generator blowers, cleaning purposes, etc. Inherent characteristics are presented and information is included on construction.

CADMIUM PLATING—A recent bulletin of the Grasselli Chemical Co., Cleveland, discusses a method developed by the Grasselli company for electrodepositing pure metallic cadmium on iron and steel. Features claimed for the process include shorter plating time, lower costs, no fumes and lower equipment cost.

TAPE—B. F. Goodrich Co., Akron, O., has issued a pamphlet on its combination rubber tape and friction tape. The tape is made of fabric completely embedded in a rubber compound with a high degree of adhesion. A joint is wrapped only once and the wrapping is said to be practically as permanent as the original insulation on the wire.

CRANES—"Overhead Handling at Low Cost" is the subject of catalog No. 214 recently published by the Whiting Corp., Harvey, Ill. The publication is well illustrated with views of the various parts of the cranes discussed, as well as numerous illustrations showing the equipment installed in a variety of industries.

HELMETS—W. W. Sly Mfg. Co., Cleveland, has issued a leaflet showing applications and uses of its helmets to supply pure air to workers in sandblast rooms. The helmet is light and is carried by a sweatband around the head as well as on top of the head by the air deflector plate. The unit consists principally of two parts, a frame made entirely of aluminum and a rubber hood made by the anode process. A blower unit also has been designed to supply clean, dry and filtered air to the helmet.

ALLOY STEEL CASTINGS—An article by Jerome Strauss and George L. Norris, entitled "Excellent Properties Developed by Vanadium Alloy Steel Castings" is presented in a recent bulletin of the Vanadium Corp. of America, 120 Broadway, New York. Various applications of that alloy are presented and physical properties of several types of vanadium steels are included.

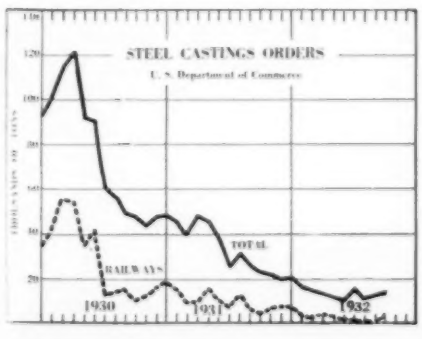
STAINLESS STEEL CASTINGS—Various applications of stainless steel castings such as for valves, pumps, oil refineries, dairies, etc., are described in a bulletin recently issued by the Cooper Alloy Foundry Co., Elizabeth, N. J. Information also is given on how to secure good stainless steel castings and the publication contains a table giving analyses, characteristics and uses.

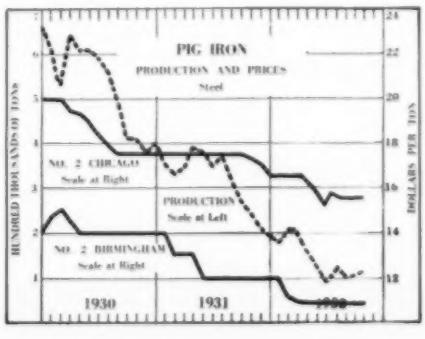
DESULPHURIZING—Mathieson Alkali Works, Inc., 250 Park avenue, New York, has published in bulletin from the paper by George S. Evans entitled "Modern Tendencies in Cupola Practice —Including Hot Blast and Desulphurizing." This paper originally was presented at the cupola session of the Detroit convention of the American Foundrymen's association.

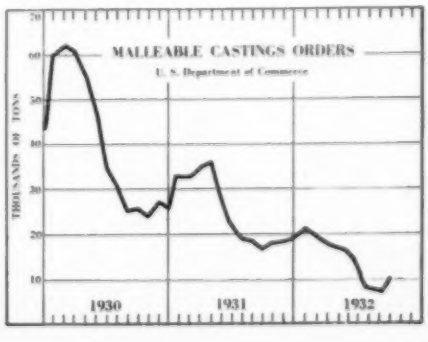
ELECTRIC HEAT TREATING FURNACE—An illustrated four-page leaflet entitled "Electric Belt Conveyor Furnace" has been published by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The publication describes and illustrates the application and uses of that type of equipment. The furnace is designed especially for such parts as require duplicated uniformity of heat treatment.

CIRCUIT BREAKER—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued two 8-page, illustrated circulars on its new line of De-ion circuit breakers. These breakers use a new method of arc extinction that enables elimination of fuses in panelboards, distribution switchboards within the breaker's capacity and industrial applications where fused safety switches now are used.

CENTRIFUGALLY CAST PIPE—United States Pipe & Foundry Co., Burlington, N. J., recently has published its "Handbook of deLavaud Cast Iron Pipe Centrifugally Cast." The publication includes a brief description of the manufacturing processes, characteristics of the product, standard specifications for deLavaud cast iron pipe centrifugally cast, types of joints, method of computing thickness of pipe, and other valuable data.







KORDEK

Reg. U. S. Pat. Off.

The *Outstanding* Core Sand Bond

. . . IT may be mixed in large quantities, and used as needed.

Bakes in the shortest time and at the lowest temperature.

Makes cores that have sharp edges and keeps them.

Leaves a clean core box.

Stands up when metal is poured, and gives off the least smoke and gas.

Produces castings of the highest grade with the smallest percentage of blow-holes and imperfections.

Breaks out of castings with greatest ease.

We will gladly have our experienced foundrymen prove to you that KORDEK is all we claim for it.

CORN PRODUCTS REFINING CO.
17 Battery Place, New York, N. Y.

*3

AMERICAN EVERSHARP STEEL GRIT

To clean castings to be enameled or painted

Steel grit cleans away scale, sand and other surface impurities by CUTTING. Thus it leaves an open, porous, velvety, all-metal surface on which enamel, paint or plating grips firmly and smoothly. USERS KNOW.

Other blast abrasives clean by a peining hammer action leaving a less open surface.

"Eversharp" Chilled Steel Grit and "Standardized" Chilled Steel Shot are blast abrasives at their best. Write for samples—prices.

The American Steel Abrasives Co.
Galion, Ohio

DIXON'S GRAPHITE FACINGS

Castings Lift Clean!

It needs but a trial to convince you that Dixon's Graphite Facings are a boon to foundry practice. They are easily applied—and do not run ahead of the metal.

Castings lift CLEAN, therefore, you save a lot of expensive cleaning and machinery.

Tell us the nature of your work and we'll send samples.

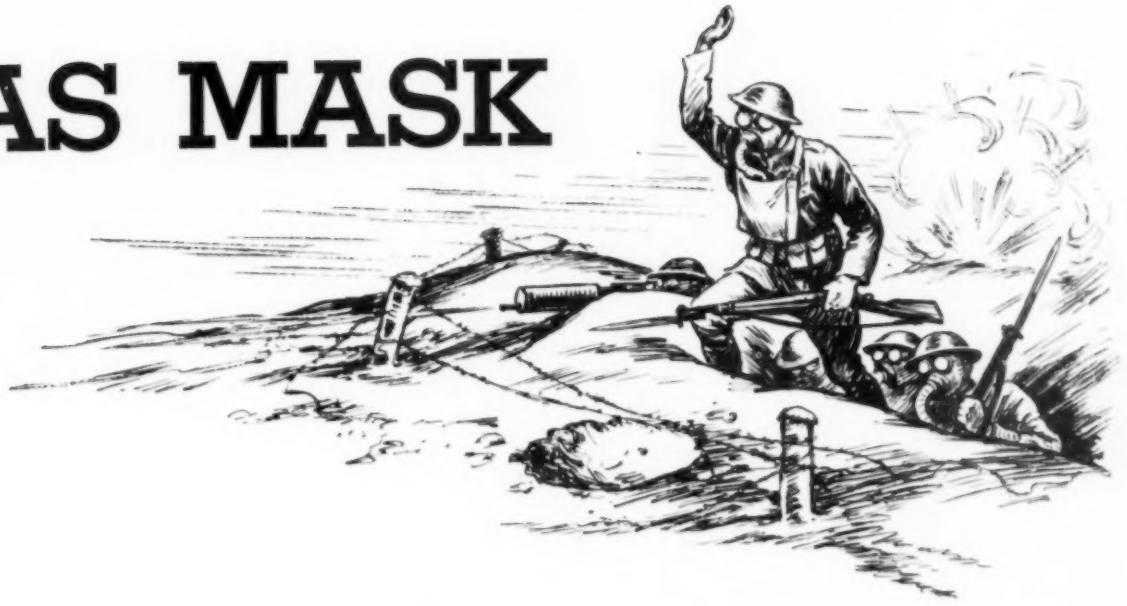
Made in Jersey City, N. J., by the

Joseph Dixon Crucible Company

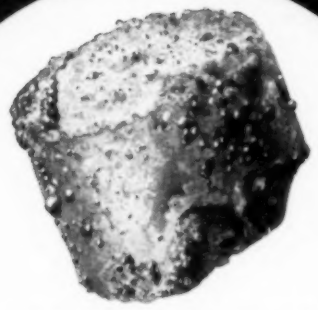
D X N TRADE MARK — *Dept. 51-S* *Established 1827* — D X N TRADE MARK

*4

GAS MASK



your Cupola Alloys WITH E. M. BRIQUETS



This E. M. BRIQUET was removed just before entering the melting zone and shows how the alloy is protected from oxidation during its descent through the upper oxidizing zone of the cupola.

WHEN vitiating gases attack a cupola alloy addition before it reaches the hottest zone, part of your alloy investment is wasted. But when your alloys are protected with the refractory binder that E. M. Briquets provide, every penny's worth of alloy-value goes into your iron—and makes it cleaner, stronger, and cheaper.

That is why cost-watching foundries are welcoming E. M. Manganese, E. M. Silicon, and E. M. Chrome Briquets as the sure means of preventing off-iron and insuring analyses that match specifications to the letter.

In your plant, E. M. Briquets can save money. Electromet representatives will be glad to tell you how. Write today for complete information.

Electromet
Ferro-Alloys & Metals

ELECTRO METALLURGICAL SALES CORP.

Unit of Union Carbide and Carbon Corporation

UCC

CARBIDE and CARBON BUILDING, 30 EAST 42nd ST., NEW YORK, N.Y.

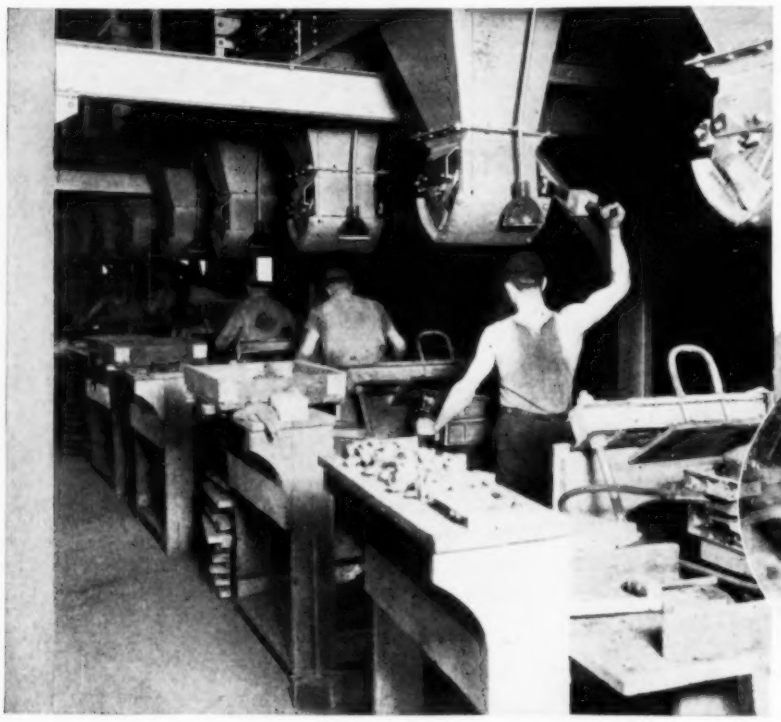
C-27

Vol. [illegible], No. 14, December, 1932, issue of THE FOUNDRY, published monthly at Cleveland, O. Entered as second class matter at the post office at Cleveland, O., under the act of Mar. 3, 1879. Subscription price U. S. $2 a year. Single copies, 25c; Canada, $3; Foreign £1

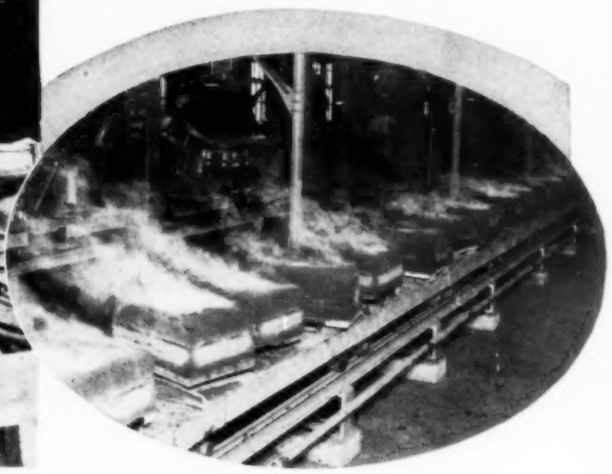
FOUNDRY EQUIPMENT

ENGINEERED

FOR THE HIGHEST FOUNDRY EFFICIENCY



Lower Prices *Must* be Met With Lower Costs



After every lull in business, the big rewards in growth and profits go to those who have taken the opportunity to prepare for the approaching period of business activity.

Today, with casting prices at low levels, foundries should heed this lesson. Business increases will come . . . and profits will have to be made at these lower price levels. For the foundry that faces these facts, there can be but one conclusion . . . castings must be produced at lower costs.

The way to lower costs is not the same in every foundry. But there are certain operations, common to all foundries, where up-to-date methods mean sure savings.

Take material handling operations, for instance. Under old-fashioned, manual methods they are responsible for the major share of total foundry costs. Yet in this field, modern handling equipment, engineered by Bartlett & Snow, has proved itself capable of establishing materially lower costs in foundries of every type. Continuous mold conveyors, mechanical sand handling and conditioning equipment or simple conveyors for handling molds and castings . . . one or all of these may be the answer to your cost problem.

Decide now to learn what savings Bartlett & Snow equipment can show in *your* foundry. Write for information.

THE C. O. BARTLETT & SNOW COMPANY · 6201 Harvard Avenue, Cleveland, Ohio

For the Dominion of Canada
PEACOCK BROTHERS, LTD., MONTREAL

For Continental Europe
Société Anonyme des Acieries ci-devant Georges Fischer Schaffhouse, Switzerland.

BARTLETT-SNOW

For Great Britain
PNEULEC, LIMITED, SMETHWICK, NEAR BIRMINGHAM